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THE AMERICAN

GAS LIGHT JOURNAL

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DEATH OF MR. WILLIAM COMBE.

We regret to report the death, at his home in this city, on the morning of October 22d, of Mr. William Combe, for many years on the engineering staff of the Manhattan Gas Light Company, and subsequently on the staff of the Consolidated Gas Company. Deceased was for many years Treasurer of the Society of Gas Lighting.

BRIEFLY TOLD.

THE RESULTS OF THE CHICAGO MEETING OF THE AMERICAN ASSOCIATION.—In making final reference to the incidental happenings at the last meeting of the American Association, which was so successfully brought off less than a fortnight ago in a city that was fairly quivering with the glow and life of a huge population that came from about every portion of the civilized world, not much remains to be said; for our telegraphic correspondence, published a week ago, was quite complete. However, some further mention cannot be considered ill timed or unprofitable. In the first place, the members were fortunate indeed in having the best of weather conditions during their stay, and they are also to be congratulated on having enjoyed acceptable and comfortable accommodations, both in respect of the meeting hall and the manner in which they were housed and fed. The headquarters, at the Victoria, were, of course, most largely patronized by the delegates, but whether members elected to stay there or elsewhere, no reasonable complaint could be uttered on the score of a lack of those attentions which go to make up a temporary absence from home more than bearable. The attendance, despite "the hardness of the times," was fairly up to the average of recent previous assemblages of the Association, and to the credit of the delegates, be it said, they were quite loyal to the aims of the Association in their close attendance upon the sessions devoted to the technical business in hand. This allegiance, too, it should be borne in mind, deserves more than passing credit, for the "magnetic influence" of the White City on everybody present in Chicago could not be denied. The magnificent display of the works and wealth of nations at Jackson Park was an irresistible that magnet to draw all in that direction, and the members, from roll call to adjournment, were faithful to their duty, shows that the mind of the gas man is bent on his tasks.

Not much time was wasted in preliminary or routine work, which was disposed of with a rapidity not savoring of either slight or undue haste, wherefore it was not long when the delegates were listening to the words of President Boardman's annual message, which is given in full elsewhere in this issue. His state paper, as we ventured to say in advance of its formal reading it would be, was pointed and pithy. Passing from the President's well and feelingly put references to the mournful inroads made by death on the ranks since the last meeting, we are brought to his allusions anent the possibility and good policy of working out in a practical way a plan for federating the Associations of the country, as prominently brought out last year in the paper by Mr. W. R. Addicks. This proposition was, if we remember aright, referred by the Association a twelvemonth ago to the Council for consideration, and if we are correct in our interpretation of the feeling aroused regarding this subject at the sessions of 1892, it was hoped the Council would have something to say on the matter when their report for the Chicago convention was ready. It is true the Council did say something about it, since we find in their presentation of general matters concerning the Association's welfare the following bearing upon federation: "The Council have under consideration the paper on 'The Gas Association and Its Members,' read by Mr. W. R. Addicks at the Twentieth Annual Meeting of the Association, and in view of the value of the matter therein set forth respectfully recommend the Association to recommit that subject to the Council at this time for further consideration." This rather odd putting aside of a subject which the Council admit contains value of matter, and which they have had before them for a complete twelvemonth, would seem to be explainable best on the ground that the Council did not sit up over night many times in 1892–3 in considering federation's varying phases; hence they would not render any *ex parte* opinion about the scheme. Speaking to our own views on the proposition, we have not the slightest hesitation in saying that there is little likelihood of the three main Associations—the New England, the Western and the American—ever joining their forces to the point of amalgamation. In fact, it does seem that all the district Associations are working on broader and more acceptable lines than is the American Association; nor is it hard to understand why this is so. To begin with, the conditions of the business are not alike the country over, nor will they ever be, save in respect of some underlying principles, which con-

cern rather the financial division of the art than its engineering division. It is true this difficulty could be overcome by having the Associations only admit to membership those who are strictly engineers, and it is equally true that such membership qualifications will never be enacted, since it is far from infrequent that the engineer is also the financial man of his Company. Again, federation looks unlikely; for, blink it as one may, there is the pride of section constantly cropping out. Nor is this a spirit that is unfair to look upon. However, no matter whether the Council gave due consideration to federation or not, it may be taken for granted that many a year will have elapsed ere the complicated scheme proposed by Mr. Addicks—and we desire to give to that gentleman all credit for the ability with which he discussed the project and for the evident study that he devoted to the presentation he made of it—will be an accomplished fact.

President Boardman seems to have been greatly impressed with the advantages to accrue from union, and it certainly is, from the point of view of those who agree with him, "none too early to begin the work of federation in earnest," if it ever is to be commenced. Of course, we all sorrow with him over the fact that electricity not only held the pride of place as an illuminant in the Fair territory, but that it did so to the virtual exclusion of gas. Still, when the Fair shall have been only a memory, every visitor who participated in its glories, when he comes to count up the cost of lighting his home or his shop or his factory, will be mainly governed in his selection of an artificial lighting agent by the comparative service obtained therefrom and the cost thereof. We do not mean to imply that the cheapest will be the one always chosen, but apart from a desire to secure a light of great luxury, or the hope of securing advertisement of one kind or another therefrom, and for which luxury or advertisement the user expects to pay a good, round price, it may be held as assured that the gas man will have five consumers to the one consumer who gives his choice to incandescent electric lighting. Of course, we know that President Boardman is as firm a believer in this regard as is the JOURNAL. There is much, no doubt, in his suggestion regarding the value of efforts to diminish the heat evolved in the combustion of gas for illuminating purposes; still it is well to remember that for at least six months in the year, and over a territory in which more than 75 per cent. of the total gas production of America is consumed, the heat from a gas burner is rather welcome than otherwise. However, let the advance be made on a line that suggests doing away with that heat during the period that the same is objectionable. The balance of the message deals with matters respecting which all are practically agreed. As we remarked before, Mr. Boardman's message was an excellent one, and it was well received. The papers were of the thoughtful kind, and received good consideration, although the discussions could have been carried on with profit at greater length—a verdict that applies also to the contents of the Question Box, when the latter were up for dissection. The officers chosen constitute a strong executive body, and, headed by Mr. Pearson, they can be counted on to keep things in order for Washington and 1894. The experiment of enforcing the no free banquet rule adopted at Savannah cannot be said to have resulted in failure, for a thoroughly good time was enjoyed by those who participated in the gathering at Kinsley's.

The social side of the convention generally was of the heartiest order, and the local Committee of Arrangements worked with nice harmony in guiding the wheels over the smoothest paths. A very pleasant recognition of the toastmaster's abilities as an all-round man was made in the shape of the presentation to ex-President Capt. White of a handsome diamond scarf pin. The presentation speech was made by Mr. Wm. J. Fay, of Denver, and the Senior Captain of the Old Guard returned the fire in his well-directed way. The meeting was a most enjoyable one.

THE MATTER OF PUBLISHING THE PROCEEDINGS.—One other thing in connection with the action of the Council at the last meeting is worthy of mention here, and that is their recommendation (subsequently ratified by a vote of the Association) to start the Association squarely in the publishing business. For a great many years the JOURNAL cheerfully bore the entire expense of reporting the proceedings of the Association, and made no charge whatever for any use the Association saw fit to make of its columns. In return for this the JOURNAL was permitted to publish the proceedings. Subsequently, when other applicants for permission to print the proceedings made their appeal and were granted a favorable response, the JOURNAL paid its *pro rata* share of securing the reports. The JOURNAL'S final reward for its action of 21 years is the permission to hereafter have the right to print a *synopsis* of that which occurs at the meetings. Perhaps the Association knew what it was doing when it indorsed that recommendation of the Council; but we do not believe so. If it did we have nothing more to say.

[OFFICIAL REPORT.]

TWENTY-FIRST ANNUAL MEETING OF THE AMERICAN GAS LIGHT ASSOCIATION.

HELD AT CHICAGO, ILLS., OCT. 18, 19 AND 20, 1893.

FIRST DAY—MORNING SESSION.

The American Gas Light Association held its Twenty-first Annual Meeting at Chicago, Ills., October 18th, 1893.

President Boardman called the Association to order at 10 A. M.

ROLL CALL.

[Up to the time of going to press the list of those in attendance has not been received.]

The President—In calling this Association to order I wish to make a request of the members, compliance with which is very desirable in order to expedite the business, and we can only do this by your hearty co-operation. In all you have to say please remember that the stenographer must hear it, and, therefore, speak in as loud a tone and as distinctly as possible. You can greatly aid the business in hand if you will give quiet and respectful attention to the reading of the papers and to all discussions. To that end if you will sit as near the front as possible you will find that it will aid us all. The Committee of Arrangements wish me to say to you that the order for this evening in regard to entertaining the ladies is to take them to the Auditorium Theater to see the play "America." The Committee sit in the rear of this room and request each of the gentlemen having ladies attending with him to report to the Committee as early as possible the number, so that they can arrange for seats. I now declare the convention in order and ready for business. The reading of the minutes of the last meeting is first in order—the roll having been called by members placing their names in the hands of the Secretary at the door. What is your pleasure with regard to the reading of the minutes?

Mr. Egner—I move that the reading be dispensed with.

The President—It is moved and seconded that the minutes of the last meeting, having been published, be taken as read. (Carried.)

APPLICATIONS FOR AND ELECTIONS TO MEMBERSHIP.

The President—The report of the Council on applications for membership and for transfer of membership is the next thing in order.

The Secretary read the following report:

[Up to the time of going to press the list of new members had not been received.]

The President—You have heard the report of the Committee on Applications for Membership. Will you appoint someone to cast the vote of the Association?

Mr. Pearson—I move that the Secretary cast the ballot of the Association for the election of the gentlemen whose names have been read.

Mr. Egner—I second the motion.

The President—It is moved and seconded that the Secretary cast the ballot of the Association. (Carried.) As tellers to receive the ballot I will appoint Mr. Frederic Egner and Mr. George T. Thompson.

The Secretary—If there are no objections I will cast the ballot for the candidates whose names have just been read for election to Active and Associate Membership. Hearing no objection the ballot is so cast.

Mr. Egner (as Teller)—Mr. President, We find that the names which the Secretary has just read as applicants for membership in this Association, having been favorably acted upon by the Council, have been duly elected.

The President—The gentlemen whose names have been read and balloted upon are declared elected. All those who are present in the hall will confer a favor by rising. Gentlemen of the Association, I present to you the new members. Gentlemen, I welcome you to membership in the Association.

REPORT OF COUNCIL.

The President—The next order of business is the report of the Council on the management of the Association during the previous year.

The Secretary read the following report of the Council:

CHICAGO, ILLS., Oct. 18th, 1893.

To the Members of the Association—Gentlemen: Your Council hereby report that the following papers have been approved to be read at this meeting:

1. "The Revivification of Iron Oxide," by Geo. T. Thompson, St. Louis, Mo.
2. "Rate of Purification," by J. A. P. Crisfield, Savannah, Ga.
3. "Mathematical Analysis Applied to Photometrical Observations in Legal Cases," by Fred. B. Wheeler, Mount Vernon, N. Y.
4. "Relation of Temperature to Purification," by Jas. Somerville, Indianapolis, Ind.

5. "Gas Engines in the United States," by Fred. H. Shelton, Philadelphia, Pa.

The following have been appointed a committee to nominate officers for the ensuing year: Messrs. Henry Boardman, Alten S. Miller, Thomas Littlehales, A. B. Slater and E. H. Jenkins.

The Council have under consideration the paper on "The Gas Association and its Members," read by Mr. W. R. Addicks at the Twentieth Annual Meeting of the Association, and in view of the value of the matter therein set forth respectfully recommend the Association to recommit that subject to the Council at this time for further consideration.

The Council also make the following recommendations in relation to the publication of our proceedings:

That the publication of the reports of proceedings of this Association be not made in full in any other form than that in which it shall be issued by the Association to its members, but that gas journals shall have the privilege of publishing synopses of the reports of proceedings.

It is also recommended that the Association publish its proceedings in a quarterly form instead of the biennial form heretofore adopted.

It is also recommended that the Association instruct the Secretary to present to the Council for its approval a list of papers prepared by members, or selected from other sources, the papers so selected and approved to be printed in the next issue of the Proceedings of the Association and discussed at the meeting next subsequent thereto.

In conclusion, the Council would urge upon the attention of the Association the necessity of the co operation of the members with the Secretary, particularly in notifying him of changes of address, and in response to his communications.

Respectfully submitted for the Council,

A. E. Boardman, President.

A. B. Slater, Jr., Secretary.

The President—Yon have heard the reading of the report of your Council. What is your pleasure in the matter?

Mr. Egner—I move that it be adopted as read.

The President—It is moved and seconded that the report of the Council be adopted as read. Is there any discussion?

Mr. Greenough—I would ask the reason for the recommendation in regard to the publication of proceedings—why is only a synopsis to be published?

The President—The Council, wishing to make the membership more valuable to the Association, thought it well to recommend that the full proceedings be published by the Association, and be the property of the Association; but that synopses of the proceedings could be taken by those papers wishing to publish them, as might suit the convenience of themselves or of the Association. In order to get these proceedings more promptly in their full extent to the Association, the Council thought best to make a quarterly publication, which would not only contain the proceedings and papers, but also allow for discussion through the journal of those papers by members who might not have been at the meeting, or members who would like to have more discussion on them. Those are the views that the Council had in mind in recommending it. Is there any further discussion on the motion? The motion is made and seconded that the recommendations of the Council as read be adopted. (Carried.)

Mr. Brown Asks a Privilege.

Mr. Brown—Mr. President and Gentlemen, I rise to ask a personal privilege of the members of the American Gas Light Association, and particularly do I feel it necessary to do so in view of the fact of the action of the meeting with reference to the Council's report which you have just heard read, and which has been adopted. Henceforth, I believe, in accordance with that recommendation of the Council, the papers and the discussion of the American Association will be confined entirely, with respect to publication, to the journal of proceedings to be issued by the Association itself. That, of course, will compel the gas papers to publish only abridged reports. I am quite willing to agree to that, so far as I am concerned in the editorship of the Progressive Age; but as the taking of an abridged report will require some experience in the way of stenographic work, I have secured the attendance of a stenographer here with the view of making a report of this meeting, in order that I may get into the harness preparatory to the taking of the subsequent reports of this meeting. I have not talked with many of the members with reference to the matter; I simply appeal to you as members of the Association to afford me an opportunity to make this report. I trust that some gentlman will make the motion, and that it will be seconded, and so let it come before the meeting.

Mr. Pearson—That does not apply to the present meeting, does it? I understand that the resolution just passed will not affect the proceedings of the present meeting.

The President—I think that was the understanding of the Council.

Mr. Pearson—It is not intended to be retroactive.

Mr. Brown—That is true. I understood it was not; but I ask this as a privilege, to enable me to make future reports. I have been told repeatedly by stenographers that gas meetings, like all technical matters, are exceedingly difficult assemblages to report; consequently I now desire to see and ascertain whether in the city of Chicago (which they claim to be the hub of the universe) they have a stenographer equal to those who are employed regularly by the Association from New York.

The President—This being a question of privilege it takes precedence, if there is any motion to be made with reference to Mr. Brown's request.

Mr. A. C. Humphreys—I understand that what he has asked for is nothing more than the privilege often accorded by similar Associations to papers which care to report the proceedings. If that is the case then certainly we should accord the privilege to Mr. Brown. I, therefore, make the motion that the privilege of reporting these proceedings be accorded to Mr. Brown as requested.

Mr. Butterworth—I second the motion.

The President—It is moved and seconded that the privilege of reporting these proceedings be accorded to Mr. Brown.

Mr. A. C. Humphreys—That is, after the manner suggested by Mr. Brown, for the purpose of preparing a synopsis.

The President—Does the seconder of the motion understand that this is to be a synopsis merely?

Mr. Butterworth—Yes.

The President—It is moved and seconded that the privilege of preparing a synopsis from a stenographic report of the proceedings be allowed to Mr. Brown upon his request. Is there any further discussion.

Mr. McElroy—I move as an amendment that all other gas journals be included.

Mr. Brown—That would meet my view.

Mr. A. C. Humphreys—It would meet my view, certainly.

The President—As this amendment has been accepted by the mover I will therefore put it as the original motion—that all journals have the privilege of preparing, from stenographic notes, a synopsis of the proceedings of this meeting.

Mr. A. C. Humphreys—All *gas* journals I presume is meant.

The President—I presume that is understood. All in favor of the motion will say aye; contrary minded, no. It is carried.

Mr. Brown—There are certain cuts in connection with the papers that I need. A few of them I have already. I presume the Secretary will permit me to have the others, or that he can arrange it in such a way as will enable me to get them.

The President—That would have to be arranged with the Secretary, because it would have to be at his convenience, as he is preparing his report, and while he has the use of them of course others could not have them.

Mr. Brown—Yes, entirely. I thank you.

The Secretary—I shall be very much pleased to loan the cuts to Mr. Brown for his use.

The President—The report of the Treasurer will now be read.

The Secretary read the following—

Treasurer's Report.

[Up to the time of going to press the report had not been received.]

The President—You have heard the report of the Treasurer for the year. I will state that owing to the absence of some members of the Finance Committee the vouchers of the Treasurer have not been entirely checked over, or the report of the Finance Committee attached to his report. But the matter is before you for consideration. What is your pleasure?

Mr. Ramsdell—I move that it be received and placed on file when properly audited by the Association. (Carried.)

The President—The report of the Secretary will now be listened to.

Secretary's Report.

[Up to the time of going to press the report had not been received.]

The President—You have heard the report of the Secretary. What is your pleasure in the matter?

Mr. McDonald—I move that it be received and spread upon the minutes. (Carried.)

Reports of Special Committees.

The President—The next order of business is the reports of Special Comittees. There is a Committee upon a Standard Meter Union. Is any member of that Committee present?

Mr. McDonald—I do not know how many of the Committee are in the room, but I take upon myself the privilege of answering. I will say to the Association that there has been nothing done since the last meeting with regard to a standard meter union. In fact, the Committee have not had a meeting, owing undoubtedly to the deaths of people who were the officers of this Committee. The discouraging condition of the Committee on Standard Unions is, I presume, the reason why no meetings have been called. I am sorry to state that it is the fact, but it is true that there has been no meeting of the Committee and nothing done since the last meeting of the Association.

The President—You have heard what one member of that Committee says. At the last meeting it was discovered that the members of the Committee had been decimated, and the privilege of adding to its membership was at that time accorded to the Committee. As you have heard stated the Committee has done nothing as yet. I think it should be allowed further time and the privilege of adding to its members, so that it may continue the work so well begun. A motion to that effect would be in order, and to save time, if there is no objection, we will make that disposition of it. There was a Committee appointed at the last meeting to take into consideration the suggestion in President White's paper relative to the disposition of tar products. Captain White was the Chairman of that Committee, and Mr. Slater and Mr. Stedman were members. There seems to be none of the Committee in the room. There can be no report from that Committee, as unfortunately none of the members are present.

Election of Officers.

The President—The next business before the Association is the election of officers. Is the Nominating Committee ready to report?

Mr. A. S. Miller—In the absence of the regular Chairman of that Committee, a meeting was held at which I was appointed Acting Chairman. They beg to offer the following report:

For President—W. H. Pearson, Toronto, Canada.
First Vice President—Walton Clark, Philadelphia, Pa.
Second Vice-President—A. W. Littleton, Quincy, Ill.
Third Vice President—C. J. R. Humphreys, Lawrence, Mass.
Secretary and Treasurer—Alpheus B. Slater, Jr., Providence, R. I.
For Members of Council, whose terms expire in 1895—W. R. Addicks, Boston, Mass.; Charles R. Faben, Jr., Toledo, O.; K. M. Mitchell, St. Joseph, Mo.; C. H. Nettleton, Birmingham, Conn.

The President—You have heard the report of your Committee on Nominations. What is your pleasure? Will you let your Secretary cast the ballot of the Association?

Mr. Ramsdell—I move that Mr. Slater cast the ballot.

The President—Mr. Slater will be voting for himself, but I suppose it will go. It is moved and seconded that the Secretary cast the ballot of the Association for the election of officers nominated by the Committee. All in favor of that motion will signify it by saying, "Aye;" contrary minded, "No." The ayes have it. I will appoint Mr. Ramsdell and Mr. Jenkins as tellers.

The Secretary—Gentlemen, if I hear no objection I will cast the ballot of the Association for the gentlemen named by the Nominating Committee for officers for the ensuing year. Hearing no objection I cast the ballot.

Mr. Ramsdell (as teller)—I have to announce that the ballot has been cast for the officers as named by the Nominating Committee.

Responses.

The President—You have elected the officers named for the ensuing year, and Mr. Pearson, of Toronto, is your President. Will Mr. Pearson come to the stand for a moment? Some of the new members may not know him as well as the rest of us do. Gentlemen, I have great pleasure in presenting to you your future President, Mr. W. H. Pearson, of Toronto. (Applause.) Mr. Pearson is the first Canadian, and the first person outside of the United States, who has been honored by your choice as President. I hope his election is a good augury and an earnest of the time in the future when we shall be one great country, and when all English speaking people in that country shall be one in national unity as they are in language, religions and customs; and that we may sometime hail as President of the great United States of America a Canadian. (Applause.)

Mr. Pearson (President-elect)—I assure you, Mr. President and Gentlemen, that I am deeply gratified at the kindly manner in which you have elected me President of this Association. Had I consulted only my own feelings in the matter I certainly would not have consented to occupy the honorable position to which you have now so kindly elected me, for I have a very deep sense of my own personal unfitness to preside over so large and influential a body as this is; but the fact that you have so kindly received this proposition gives me the assurance that in the future you will kindly overlook any shortcomings which you may notice in connection with my—government, I was going to say—my Presidency of this Associatton. I assure you that I take this not only as a compliment to myself, but as a greater compliment to the country to which I have the pleasure and honor of belonging. (Applause.) I am not a native Canadian—I was going to add, "I am sorry to say"—but I am a Canadian in feeling and sentiment; and I can heartily assure you that there is nothing but the most kindly sentiments entertained upon our side of the water towards our neighbors on this side; and there is one thing which is certainly tending to produce the most cordial feeling, and to cement the friendship already existing between the two nations, and that is the intermingling of the peoples of both countries in such associations as this. I assure you that while I am deeply conscious of my own personal deficiencies, I shall give my very best attention to the business of this Association, and shall lay myself out, amidst my multifarious duties, to do all that I can to promote its interests. (Applause.)

The President—The next thing in the order of business is the address of your President, and if you will be so kind as to listen I will read it.

PRESIDENT'S ADDRESS.

Gentlemen of the Association: This convention marks the twenty-first anniversary of the birth of this Society, and it is singularly appropriate it should be in the city of Chicago, where the world is celebrating the discovery of this Continent, that the American Gas Light Association celebrates its coming of age. Appropriate, since the industry we serve has been such an important factor in the advancement of the civilization whose crowning glory is this World's Columbian Exposition; because the economical increase in the number of hours that human industry may be profitably employed has hastened the progress of the race.

At this particular time it would be most instructive and entertaining to summarize the history and accomplishments of this vigorous young body, just reaching the legal age of maturity; but its history lies in the life work of its members, and its accomplishments in the position the gas industry has attained throughout this broad land, hence it is beyond the province of your President's address. Before leaving this subject, however, it is well to pause and think with gratitude of the founders of the Association, and with regret that so many of the men to whose enterprise and devotion we are indebted for the inception and establishment of our prosperous Society, have joined the "silent majority." Of the original members only eleven survive, namely: Thos. R. Brown, Wm. H. Baxter, Wm. Cartwright, J. H. Cowing, J. R. Floyd, T. D. Gilbert, W. W. Goodwin, Wm. Humphreys, W. H. White, A. C. Wood and O Zollikoffer, and we sincerely hope that their presence may cheer and encourage us for many years to come.

During the year just closed the Grim Reaper has been busy in our particular field, and many are the ripe sheaves that he has garnered. The first that fell before his sickle was the well known and much beloved Geo. A. McIlhenny, whose long sufferings terminated on the eve of our last meeting, and whose loss cast a shadow of profound sorrow over our otherwise enjoyable convention. While his obituary has been written by abler hands, you will pardon me for devoting a few moments in adding my testimony to his upright life and lovable character. He was Superintendent of the works in Macon, Georgia (of which I have the honor to be President), under the Presidency of my late lamented father, and to his ability and industry all the prosperity of the Company was due, through the trying years of the great Civil War. He it was who encouraged me to adopt this profession, and to his valuable advice, freely proffered at all times, I owe most of the success with which I have been blessed. In his death we have all lost a friend, but by none is he more sincerely mourned than by me.

On October 22d we were called upon to mourn the death of Mr. John J. Griffin, of Philadelphia, Pa.

Following almost immediately came the sad news of the death of Mr. Peter E. DeMill, of Detroit, Mich., which occurred on October 31st. He was the first Secretary of the Association.

On November 1st, Mr. Austin W. Copp departed this life. He was Treasurer of the Plymouth (Mass.) Gas Light Company, and connected officially with several other gas companies in that State.

The new year had just greeted us when we were saddened by the death of Mr. Frederick H. Odiorne, which occurred on January 3d. Mr. Odiorne was President of the Gas Companies of Gloucester and Plymouth, Mass., Exeter, N. H., and Rockland, Me., and was with us during the Boston meeting in good health and spirits.

On April 25th, at Rochester, N. Y., Mr. Matthew Cartwright passed away. He was well and favorably known in the profession, and a mem-

ber of the Executive Committee of the Association during the years 1890-91-92.

The death of Mr. Edward Jones, formerly Superintendent of the South Boston Gas Light Company, occurred on August 1st, at his home in Boston. Since 1834, Mr. Jones had been connected with the gas industry, and many works in New England remain as monuments to his skill and energy. Fortunately we have still with us his worthy son and successor, in the person of Mr. Edward C. Jones, now of San Francisco, to whom we extend our heartfelt sympathy and condolence.

To attempt to give even an outline of the achievements of these lamented brothers in the craft would consume more than the "allotted half hour," the limits of which this paper must not transgress. Hence the task of preparing suitable expression of our sorrow must be left to the Secretary, as is our custom.

During the year the business of the Association has prospered, as will be seen by reference to the report of your worthy Secretary, and your Council has been diligent in promoting the interest of the Association in every possible way. Matters of considerable moment have been thoroughly discussed, and I can heartily endorse the recommendations that will be presented for your consideration and adoption.

At the Boston meeting a paper read by Mr. W. R Addicks, on "A Gas Association and Its Members," created widespread interest and considerable enthusiasm among the members of this Association. The Council has had the subject in mind, but the discussions developed the fact that the plan outlined, although very desirable, was hardly adapted to the requirements of the Association as they now exist, and that a concerted action of the various societies would be necessary to accomplish results. Therefore, further thought and consideration are deemed advisable. A study of the plan in operation in Germany and that proposed by the British Societies might be profitably made before mapping out one for this country. At a meeting of an English Association the following resolutions were passed, which might give us a hint as to the method to be pursued :

I.—"That this Association approves of the formation of a federation of the various District Associations, together with the Gas Institute, and Institution of Gas Engineers.

II.—"That this Association cordially invites the several District Associations to appoint two or three representatives each, and the Gas Institute and Institution of Gas Engineers four representatives each, to meet in conference at a meeting to be held in London in August or September next."

This is an important matter for the future of our Association and for the advancement of our profession, and it is none too early to begin the work of federation in earnest.

In visiting the World's Fair and viewing the many wonderful and beautiful exhibits, that which will most attract a gas man is the marvelous display of the progress of electricity as applied to the uses of man. The development in this direction has been indeed *marvelous*, and nowhere else can this progress be better seen and appreciated than in the White City, at Jackson Park. It makes more poignant the regret we feel that no adequate exhibition has been provided of the uses of gas. The masses will be persuaded that the claims for electricity as being the light and power of the future are fully demonstrated. It is only those conversant with the true state of the comparative cost and possibilities of the two who can feel encouraged for gas, when face to face with the results in electricity now on exhibition. To the leaders in this industrial contest, however, the present view of the entire field is most encouraging to the gas maker, and the display of the whole strength of the opposing forces should only nerve our hearts and hands to still greater exertion in order to place our product more prominently before the public. And to this end I desire to call attention briefly to one or two directions in which we can push our advantage.

Two of the reasons why many prefer the electric incandescent lamp are its freedom from liability to injure daintily colored walls and ceilings, and the small amount of heat developed at the burner. The light emitted is not so great as a good gas jet of the ordinary pattern, and the cost per unit of light is much in favor of gas. Unfortunately in our efforts to increase the illuminants in our gas we increase the liability of the burners to smoke, and the light emitted bears a very small ratio to the heat produced in burning the gas. Our best examples of regenerative burners are liable to smoke, and the heat developed is a serious hindrance to their adoption, as well as is the large first cost. Hence it was that many of the progressive gas engineers welcomed the appearance of the Welsbach incandescent gas burner, as a departure in the right direction from the ordinary method of using gas for light. The first of these burners proved disappointing, however, and the fear was entertained that the defects were too radical to admit of remedy. Not discouraged by lack of success, however, experiments to perfect the burner were continued, and now with the improvements resulting we have reason to believe that the burner in its latest development can be made to compete successfully with the incandescent electric lamp. With the best regenerative burners an efficiency of 10 candle feet has been considered a very marked advance in gas lighting, and so it was ; but a Welsbach burner gives a lighting efficiency to begin with of fully 22 candle feet, and during the first 1,000 hours the depreciation amounts to only 35 per cent., when it still gives an efficiency of 15 candle feet. Compare this with the incandescent electric lamps and we find the depreciation to be fully 43 per cent. in the same length of time. I have a record of a Welsbach burner which gave an efficiency of 22.7 candle feet when first lighted, and with a slowly decreasing efficiency, at the end of 7,000 hours' burning, gave an efficiency of 9.3 candle feet, or about equal to the best regenerative burners. Could the mantles to these burners be furnished and placed in position at as little cost as a glow lamp, the great economy in the gas used would be inducement for every one to try them. The quantity of heat emitted for the amount of light is astonishingly small. In this respect, quoting from Baron von Oechelhaeuser, of Dessau, "As an ordinary gas flame of 16 candle power develops about 900 calories, a Welsbach burner of 50 candle power, with about 540 calories, gives only two thirds of the heat of an old gas light of 16-candle power ; or if this luminosity of 16 candle power be taken as a basis of comparison, only about 170 calories are developed, and therefore about *one fifth* of the heat previously associated with 16 candle power light. According to Renk, an electric glow lamp of 16 candle power develops 46 calories. Therefore, a 16 candle Welsbach light gives only 3½ times the heat of the electric incandescent light ; whereas hitherto a gas light of 16-candle power has produced nearly 20 times the heat. *A diminution of the heat as compared with electric light from 20 times to only 3½ times, is, in practice, tantamount to light without heat.*"

And in regard to the liability of damaging walls and ceilings, von Oechelhaeuser continues : "The products of combustion have naturally diminished with the quantity of heat to one-fifth of that previously produced for the same luminosity ; and besides that, the combustion of the gas is so complete that the formation of soot is quite out of the question."

The efficiency of these burners in out-of-door illumination may be observed in the Old Vienna Village, at the Midway Plaisance, at the World's Fair, and will probably set at rest any doubts as to the steadiness of the light under such conditions.

There are two other points in regard to the Welsbach burner that will contribute largely to its ultimate success. One is that the area of the luminous surface in the gas burner is about eight times that of the electric lamp, and must therefore have greater diffusive power and be less hurtful to the eyes. The second is that an increase of pressure in the gas supplied increases the efficiency of the burner, and that, too, without decreasing its life. This will enable the future engineer to distribute a much larger quantity to his consumers through the same mains as at present, without decreasing his candle power at the burner ; and since the diminution of candle power caused by great pressure, as effected in an ordinary burner, does not obtain to any appreciable extent in the Welsbach, ordinary gas may be furnished to suburban dwellings much as the Pintsch oil gas is now supplied to railway cars.

The observance of the fact that the compression of gas, as ordinarily made for illuminating purposes at our works, does not decrease its heating power in a degree at all comparable with the decrease in its illuminating power as generally used, leads me to another field that is open to the gas maker, but which is at present occupied almost exclusively by the electricians. Of course we are more or less familiar with the gas engine, and the great benefit it has conferred upon the gas maker, as well as the users of small power, and the competition with the electric motor in the ordinary uses for small and intermittent power is well under way. Nothing that I can say would add to your appreciation of the importance of pushing our advantage in this respect. But it is the use of the gas engine as a motor for street cars that I wish to particularly call your attention, and to counsel a thorough and diligent study of its great advantages over electricity. As in the case of the Welsbach burner, the first attempts to adapt the gas engine to this particular service were quite discouraging, but similar perseverance has brought corresponding success, and you have in this city at the present time examples of the successful use of gas engines as street car motors. In the earlier experiments it was thought necessary to use Pintsch gas, because the supply for the engine must be compressed ; but lately recognition of the small effect of compression on the heating power of ordinary illuminating gas led to the trial of using it in place of the Pintsch,

and the results have been more gratfying than the inventors dared to hope. Ordinary gas compressed, as was the Pintsch gas, was found to give 80 per cent. of the efficiency of the latter, and of course at much less expense.

The cost of building and equipping a street railway for the use of gas motors is considerably less than for electricity, even with the overhead trolley, which must soon be discarded for the much more expensive system of underground wires. The running expense and repair accounts for a road operated by gas motors are far less than one operated by electricity; and the erection and maintenance of a power station is entirely unnecessary in a town having a gas works. The gas company can compress the gas and deliver it so compressed at the street car stable; or a small room at the stable can be devoted to the compression machinery, and a gas engine to furnish the power to operate it. In either event the street railways could be made large gas consumers, to the mutual advantage of the shareholders in the street railway company and the gas company.

When I think of the many and varied appliances by which light, heat and power may be furnished to our consumers, by means of the gas flowing through a single set of conductors—and I notice that economics are making greater headway along the lines of developing and utilizing the great heating power of our product—the thought is forced upon me that perhaps we have been pursuing a wrong policy in adding costly enrichers, in the shape of cannel coal, oil and the like, to increase the luminosity of the gas without correspondingly increasing its heating power. Would we not have made more real progress in developing and utilizing the much greater *heating* power of our gas? I do not wish to be understood as advocating the manufacture and distribution of a fuel gas, such as has been heretofore designated as a fuel gas. Such a proceeding would necessitate the abandonment of many appliances already invented and adapted to the gas now in use, also the invention and manufacture of new, to suit the fuel gas, and would be of doubtful business policy. What I do advocate is the energetic introduction of all appliances for light, heat and power that are best adapted to the economical production of each by the use of the most powerful attribute of our gas, its *heating quality*, the manufacture of the gas having the greatest heating power per unit, at the least cost, and its distribution under greater pressure than at present, so as to increase the carrying capacity of our mains at the least expense.

A review of the advance in the quantity of gas sold by the various manufacturers during the past year is very gratifying, and the decrease in the cost to the consumer has been quite general in all parts of the country. How much of the increase in output has been due to the increased use of appliances other than for lighting, it would be interesting to know. It is evident that the inroads made by electric lighting have been counteracted in almost every instance, and the use of gas is steadily increasing. However gratifying this may be for the future as to the use of gas, there are tendencies growing which cause grave apprehensions to those of us who have direct charge of, and are interested in, the properties themselves, as well as in the results of manufacture. I allude to the growth of communistic ideas in all our cities, which is made manifest by the efforts in all parts of the country to operate the works on behalf of the people alone, irrespective of the ownership. In many instances it is by the condemnation and purchase of the works, in others by the forced reduction in prices under laws made by the representatives of the very people who are to be most benefited at the expense of vested interests of the actual owners. Nor are the courts free from the influence which directs these movements. Themselves the appointees of Legislatures elected by the popular vote, it is impossible for them to be free from bias and independent of public sentiment as controlled by public greed.

Nor are the gas companies alone the sufferers from this growing tendency. Water works and electric works are alike subject to the popular sentiment for municipal control. Street railways, and even steam railway and telegraph lines, are being looked upon as suitable properties to be converted to the ownership of the State. The marked examples of the ills of municipal ownership of such works as are exhibited in the Philadelphia Gas and Water Works and the Wheeling (W. Va.) Electric Works, and others that might be mentioned, do not deter other cities from like experiments. Nor do they serve to educate even such as make a study of economic questions, unless they are especially equipped by a knowledge of the gas business.

How we may protect our properties from attacks similar to those made upon Cleveland, Boston and Detroit Companies, and from almost confiscation, as has been the result in some instances under my own observation, is a matter of much import to members of this Association. The encouragement that the Gas Companies in each State, with proper co-operation, might extend toward the appointment of State Commissions, similar to that in Massachusetts, is well worthy of trial. Still we must not shut our eyes to the danger that lies in placing so much power in a Commission that might be controlled by politics or influenced by popular clamor. Although the State of Georgia has a Railroad Commission of as honest and intelligent men as could be placed upon it, the majority of the railways in Georgia are in the hands of receivers, partly because of the reduction of freight rates by the Commission, and the attempt to regulate by hard and fast rules a business existing under greatly varying conditions.

In the near future many of those within sound of my voice will be called upon to decide, as experts, upon the value of works which municipalities will attempt to confiscate under cover of law. Fortunately the law provides for an arbitration upon the price to be paid for private property taken, or condemned, for public use. Upon our proper understanding of what constitutes such works, and our ability to explain it to the lay members of the Arbitration Board and our firmness in maintaining our convictions, depend the safety of investors in gas securities. The popular idea, and the one that we will have to combat almost single handed, is that the value of a gas works consists of the cost of the pipes plus the labor of laying them, the present value of the real estate, cost of buildings, holders and machinery. In short, the amount of money it would require to construct a duplicate plant at the time the arbitration is made. Only that, and nothing more. We suggest the value of the franchise, rights and privileges. They argue that these were *given* to the company and cost nothing, and besides the city does not need them. *Given, indeed!* We know very well that they were acquired by the expenditure of large sums of money at a very great risk, the unremitting labor and thought that have been expended in building up the business and complying with the requirements of the franchise, and the many years of weary waiting for interest to be paid upon the investment in the infancy of the undertaking.

We place a valuation upon the "good will" of the corporation. The witty member of the Arbitration Board wonders if any gas company ever possessed the good will of its customers, and the serious member intimates that if the city should build opposition works all the customers could be obtained from the company with only the expense of connecting them. In short, that by its own action, the municipality can depreciate the value of the property under consideration, and therefore it should be allowed to take advantage of this fact.

We should maintain that the property should be valued to the municipality at no more and no less than to private parties, real or artificial. A private purchaser would consider the earning power of the plant under a fair price for the product, the previous rate of growth, the district to be supplied, whether residential, manufacturing, commercial, or all together, and the probable increase in the near future. He would also consider the capacity of the plant to supply the present and prospective demand, and the probable expense necessary to increase that capacity. In short, he would look at the value of the works as a live and productive piece of property, and not as a collection of land, buildings, machinery and pipes. He has been known to give three millions of dollars for works that could be duplicated for half that amount, and who would say that the previous owners should have been forced to sell to the city for one and a half millions of dollars, or that the purchaser should be allowed to charge for gas only so much as will pay him a fair rate of interest on the cost of the duplicate? Hence it is as a living entity that we must treat a gas or water works, and value it in accordance with what it will do.

The weight of a horse varies within narrow limits, the cost of raising and maintaining him within still narrower. His life is very limited at best, and his hide and carcass would be comparatively valueless; still the value of horses varies a hundred fold, and is dependent upon the performance of the individual. So with different works, the cost varies with the dimensions, in some degree, but the value depends upon so many other conditions that the only correct method of arriving at a proper valuation is by considering the performance.

And this suggests another thought. In our papers and discussions we have frequently, and very properly, insisted upon maintaining a small capitalization per 1,000 feet of output per annum; and we have been tempted to criticize severely the large capitalization of some of the works in our principal cities. While the smallest amount of capital possible per 1,000 feet of output is very desirable from the engineer's standpoint, and enables him to make much better dividends at a lower charge to consumers, it is not always fair to the stockholders nor safe as business policy. He who invests in real estate in a good location and in a growing city, enjoys increasing returns upon the amount originally invested and sees the salable value of his property steadily increase, without any

labor or further expenditure on his part. He who purchases stock in a newly chartered bank, which by good management, fortunate position and growing population, has its deposit account greatly augmented, and lays by a handsome surplus, enjoys increased dividends and market value of his stock without personal labor or outlay of more capital. He who builds a factory and by his own efforts and management, and by the increase in population to be supplied is enabled to amass wealth, enjoys the fruits of his labor as well as the unearned increment, as in the other cases. In none of these instances is his right to enjoy the increased earning power and value of his property questioned. But should he invest in a railway, a gas works, a water works, an electric lighting works, or in any corporation enjoying State or municipal franchises, and used by the public, and his dividends increase by reason of the growth of population and demand for its services beyond the average interest upon money, then is demand made upon him to share his good fortune with the public, or to refund all that he may receive in dividends above the interest rate. It matters not whether this increased prosperity is the result of former deprivations and savings, or of careful management, or merely of fortunate circumstances outside the control of the corporation.

The public can protect itself from extortion in two ways, either by inviting and encouraging competition as in the case of manufactories having the entire country, or world, for a customer; or where competition is too expensive, as in the case of gas and water works, restricted to a narrow field for custom, it can become a profit sharer by regulating prices while at the same time protecting investments. By assuring safety and permanency to invested capital it can be had at lower interest rates, and by allowing increased profits to such undertakings upon conditions of lower prices to the public, a healthy stimulant is given to promote the use of improved methods and more careful management. The prevailing policy of destroying the element of safety and at the same time demanding *all* the profits above bare interest upon plant is the great menace to our business—more dangerous than any competition we have to fear from electricity. To successfully combat it will require our united and determined efforts, for the public must be educated to a right understanding of the questions involved, and to accomplish that will require many men and many minds. Let us hope that the men and the minds may be found in the membership of the American Gas Light Association.

Mr. Egner—I move that the address of the President be referred to a committee to report upon its recommendation.

The motion was carried, and the President appointed as such committee Messrs. W. H. Pearson, E. H. Jenkins and B. E. Chollar.

The President—The next business is the reading of papers. It is very desirable that the hall should be perfectly quiet, as many of our members are not blessed with a clarion voice that can be heard at a great distance, or with much noise in the room. I would suggest that as many as possible of the members come forward and take front seats. Let us be as near as possible together.

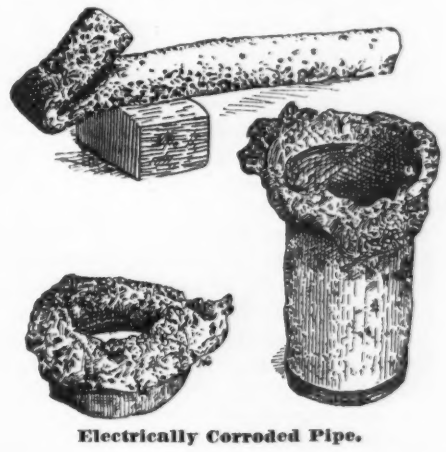
[To be continued.]

Electrolysis of Underground Pipes.

Engineering Record says: During the last three or four years a growing dread of the electric street railway has been marked among companies which are obliged to have pipes underground near the tracks of such roads. This feeling is equally strong among the gas, water and telephone interests, and that there is ground for it has been amply proved in many cities in the United States, England, Germany and France. The gas and water companies in Cambridge, Mass., were among the first to make a scientific investigation into the matter in the United States, although pipes and mains destroyed by stray electric currents had been dug up in other cities some years previously.

In Cambridge the problem was attacked by Hiram Nevons, Superintendent of the local water works, C. H. Morse, City Electrician, H. A. Allyn, of the local gas company, and F. S. Pearson, the electrical engineer of the West End Street Railway Company. The conditions in that city were anomalous at the time the trouble was first noticed. The railway company in building its lines laid a wire along the center of each track and connected the rails on each side to this wire. As the road was then operated the electric current left the positive poles of the dynamos, flowed through the large feeder cables to the trolley wires, from the trolley wires down the trolley arm to the wiring of the cars leading to the motors, and from the motors through the rails and this underground wire back to the negative pole of the dynamo. After a time, however, trouble arose. It was found that the return wire, originally the size of a lead pencil, corroded away in places, especially if the earth was moist. When a rail was left without connection, by corrosion, in this manner, and a man touched it with one foot while the the other was on the ground, he would receive a shock if a car was near. The railway company experimented for some time on the matter and then completely changed the conditions of operation on its lines. Current was sent from the dynamos through the former return circuit to the cars and then back through the overhead trolley wires and feeders. As soon as this change was made there was trouble among the gas and water pipes. Lead pipes disappeared in six or eight weeks, brass pipes corroded as soon as laid, iron pipes, even when galvanized, deteriorated rapidly, and rustless iron belied its name. Mr. Morse states that there was no corrosion except at the positive poles where the current left the pipes, and this is the case in over half a dozen cities where electrolysis has since been marked. The destruction of pipes was so marked that the railway company decided to return to its old method of supplying current through the overhead wires and allowing it to return through the ground, and since this method of operating has been in force the trouble has diminished.

The nature of the electrolytic action is really very simple, and the phenomenon itself has been known for several hundred years. Mr. Morse has explained it very well in essentially the following words: A difference in potential of two volts in a current flowing from one piece of metal to another through moisture causes the decomposition of water. The water separates into two gases, oxygen and hydrogen, at this place. The former gas attacks the pipe, pitting and eating it until finally



Electrically Corroded Pipe.

it is destroyed for practical purposes. The remedy is obviously to connect the pipe or cable with a metallic circuit leading back to the power house. In Cambridge this is done by heavy copper wires leading from the water pipe. Unfortunately, as soon as this was done the electricity was attracted from the gas company's mains to the more highly conductive water pipe, and thus the gas mains were injured. Finally it was decided to connect the gas and water mains together in every building by soldering copper wires between them. That this was necessary the following incidents, given on the authority of Messrs. Morse & Nevons, show pretty conclusively:

"Such an amount of current was flowing over the pipes that upon attempting to make a joint by putting oakum around the pipe it was found at times that the electric arc was often sufficient to set fire to the oakum. This did not necessarily indicate a very high potential, but proved the presence of a large quantity of current in the earth. This is indicated also by an experience at a new engine house in East Cambridge. There was a new and an old water main leading into this station, and when they were connected by a medium size wire it was heated so hot that the hand could not be placed upon it."

The experience of Milwaukee, Wis., was similar in many respects. City Engineer George H. Benzenberg recently stated that about a year ago a service pipe leading from a water main into a power station of the local electric railway was found to have corroded entirely away. It was replaced by a second pipe, which very soon began to leak also, and three months after it was laid broke entirely. Upon examination one length of it was found to have gone entirely, and another to be pretty well corroded and eaten out. The metal was so soft and spongy that the end of a cane could be poked through it; but after removal from the ground it became hard again. The railway company had been connecting its ground wire with the fire hydrants, and about 200 such connections had been made without Mr. Benzenberg's knowledge. The current apparently did no harm to the hydrants, mains or pipes until it left the pipe at a point opposite the station to reach the dynamos. Here

the pipe was corroded as already mentioned. To remedy the trouble a copper conductor has now been attached to the mains near each power house and led to the generators located in them. The same phenomena have been noticed in Brooklyn, N.Y., Columbus, O., Indianapolis, Ind., Sault Ste. Marie, Mich., Hamilton, Ont., and other American cities, and everywhere the trouble seems to occur at the points where the current leaves the pipes, as would naturally be expected by the analogous phenomenon in electroplating.

From the experience gained in the above cities it is apparent that the electrolysis is largely due to the lack of a metal return circuit of sufficient conductivity between the cars and the dynamos, and it is now pretty generally admitted that railway companies will find it more profitable to make a good return circuit than to force their return current through the earth.

Some engineers estimate that from 5 to 20 per cent. of the current is lost on this account, the percentage varying with the conductivity of the earth, but it is possible that such estimates are over the actual amount. Still it has been the practice until recently among the most advanced elecricians to add 20 per cent. to the weight of copper feeders to allow for earth and rail resistances, this addition being made on assumed conditions. Although this has been the best practice many have assumed that the earth-rail return offered no resistance, even without bonds connecting the separate rails. Recently some measurements have been made by R. L. Warner and G. L. Thayer, which give some definite information on the subject. The full report of these experiments can be found in the *Electrical Engineer* for 1892, but the following figures give the results of most interest to engineers working on electrolysis. The resistance per mile of double track road was found to be 0.7675 ohm in dry earth without bonds connecting the rails. Where the rails were bonded with iron wire of No. 3 gauge and cross-connected without a continuous return wire the resistance was 0.0797 with dry and 0.0717 ohms with wet earth. Where the track was formed with No. 3 copper wire bonds riveted to the rails, each bond soldered to a continuous copper wire of the same gauge and the rails cross-connected every 200 feet the resistance was 0.0207 ohm with wet earth. When the track was made in the same way as in the last example, but further improved by soldering the riveted bonds to the rails and spacing the cross-connections closer together, the resistance when the earth was dry amounted to 0.0254 ohm. Track bonded with two No. 4 galvanized iron wires without a continuous return wire had a resistance of 0.0577 ohm when the earth was dry.

These figures are very instructive, and confirm, so far as they go, the assumptions made by Lieutenant Crosby, Dr. Bell and other engineers. They show that some bond is necessary, and furthermore, that the resistance of the rail section is so slight that the calculated resistance of the bonds accounts for nearly all of that observed. This suggests a practical point, namely, the desirability of making the bonds larger than is now the usual practice and omitting the return wire. The effect of this wire has long been generally acknowledged to be small, and its value to be chiefly as a supplement to the bonds. There is a strong tendency now to do away with it entirely. It increases the conductivity of the return circuit somewhat, but probably not as much as if the metal in it were used to make larger bonds. A Johnson section 80, No. 254 girder rail, for example, weighing 80 pounds per yard, has about the same conductivity as a copper wire 1¼ inches in diameter, while a section H, 60 pound Lewis & Fowler box rail has about the same resistance as a copper wire 1½ inches in diameter. No such amounts of copper have yet been used to make bonds, and until they have, the possibilities of rail returns have not been exhausted. If the copper in the return wire in the third kind of track mentioned in the last paragraph were placed in the bonds, the latter would be over an inch in diameter instead of 0.23 inch, and the actual conductivity of the return over thirteen-fold greater. This shows that water, gas and telephone mains can be protected by better track construction, which will prove as advantageous to the railway company as to the other interests. This is one of the means of protecting mains from electrolysis, and suggests the following as a second method, which in most cases can probably be applied without much trouble.

This second method is merely the connection by metal circuits of the water mains, gas pipes and telephone cables, to which some electricity will probably always pass, with the generators at the points where there is the least resistance to return currents. These are not necessarily the points where the distance between the pipes and the generators is the shortest, for it is possible to have this shortest line through dry sand and a line nearly a few hundred feet longer through moist earth with less resistance. The electricity of the return current would be apt to leave the pipes at the moist places under such conditions, and it is possible that the return metal circuit should be located here, although somewhat longer than at another point. Old rails, heavily bonded, have been suggested for such a use, and would probably prove satisfactory.

[Concluded from page 584.]

Gas Consumption.

[From "Series of Articles for Gas Students," in the London *Journal*.]

IV.—*Pressure Regulators, Fittings, Etc.*

Consumers' Gas Governors.—These are of two classes: Service governors fixed at the meter, for controlling the whole of the supply; and automatic governor burners, which control each light separately. The former are again of two kinds—mercurial, and disc or diaphragm. The mercurial service governor consists of an outer case, provided with inlet and outlet pipes, and in which is contained a metallic bell dipping into an annular trough of mercury. The upper side of the bell is open to the atmosphere, although, to properly protect it, it is provided with a loose fitting or a perforated cover. Provision is made for placing small metallic weights on the bell, as may be required. Suspended from the bell on the other side, is a short spindle carrying a conical valve; the latter working about a suitable orifice and seating, provided in a horizontal partition which divides the inlet from the outlet chamber of the governor. On gas entering the governor, the initial pressure tends to raise the bell and thereby close the valve. The bell is then gradually weighted, until it allows an outlet pressure just sufficient to supply the requisite number of lights. Once adjusted, it will maintain that pressure whatever the inlet pressure may be—provided the latter does not fall *below* that required on the outlet. Should more gas be required for more lights, another weight will increase the pressure accordingly. Peebles' and Stott's governors are in construction much as the above; but the latter (as also Shaw's governor) is provided with two valves—one each on the inlet and outlet orifices—both being fixed on the vertical spindle, and actuated by the bell.

The diaphragm governor is similar in all respects to the foregoing, except that, in place of the metallic bell and mercurial seal, a horizontal membrane, usually of leather, is fixed. To the center of this diaphragm a spindle is attached, which carries the regulating valves. Both classes of governors must be fixed perfectly level, to prevent "binding" of the actuating spindle, and to ensure the correct action of the bell or disc.

The automatic governor burner provides a means in the body of the burner itself for regulating the quantity of gas passed to 4, 5, 8 or 10 feet per hour, as the case may be. Sugg's diaphragm regulators were amongst the earliest of really efficient governors; but these are now worthily superseded by metallic disc governors. Peeble's needle governor is well known. The gas is controlled by the rising and falling of a cone which floats in a gas chamber, rising or falling as the gas pressure is increased or diminished, and in this way opening or closing a valve, and regulating the flow of gas to the burner. It is not a regulator of pressure, but of volume; and the floating cone so regulates and measures the quantity that is consumed, and may be so depended on, that the quantity the burner is rated to pass per hour, multiplied by the number of hours the gas is used, will give the total quantity consumed for any given time. In Sugg's, Borradaile's and other governors steatite floats are used, which, rising and falling with fluctuations of pressure, open or close small gas orifices, and thus maintain the correct rate of consumption.

Globes, Shades, Etc.—Two or three points in reference to the employment of these aids (?) to successful gas illumination require the attention of the reader. When constructed and utilized in an intelligible, not to say in a scientific manner, these appendages may aid considerably in gas illumination. The far too common narrow-necked ground glass dirty globe is, however, an abomination that cannot be too strongly condemned; and the manufacturers of elegant chandeliers and candelabra which are fitted for these globes only ought to be "boycotted" by the gas profession. Scientists say the absorption of light passing through the varieties of glass named below, and under conditions, as regards illuminating power and distance from the light, of ordinary coal gas consumption, is roughly as follows:

	Absorption of Light.
Average sample of sheet clear glass.....	8 to 11 per cent.
" " ground "	40 to 56 "
" " opal "	55 to 60 "

In actual practice, although the absorption may equal or exceed the above figures, the absolute loss of light is less, owing to certain advantages accompanying the employment of the globes, and also due to the fact that the *curved* glasses absorb less light than sheet glass. These

figures do not allow, however, for the dirty condition in which ground glass globes are generally to be found, and to which may be attributed another 10 or 15 per cent. loss of light. The object of the writer in touching upon this subject is chiefly to point out the enormous advantage to the gas consumer of using the modern shape of globe.

The objections to the first mentioned may be summed up as follows: Reduced illuminating power of the flame itself—due first to cooling of the flame by the rapid rush of air, caused by the contracted opening at the bottom of the globe; and, second, to incomplete combustion of the gas, arising from the same circumstance. Absorption of (say) 33 per cent. by the globe itself of what light is produced inside of it. Irretrievable injury to readers' eyesight, caused by the irritating flickering of the flame, due to the aforementioned rush of air. On the other hand, the advantages of a good opal globe of the modern pattern are: Perfect combustion of the gas, with full lighting duty therefrom, owing to the absence of air rushes and cooling draughts. Steady flame of uniform shape. Greater cone of light through the opening at the bottom of the globe, and refraction of light from the inside of the lower portion of the globe. Increase of light within easy distance of the lamp. With a consumption of (say) 5 cubic feet of 17-candle gas per hour, this increase will probably be not less than 40 per cent., compared with the old-fashioned narrow necked globe.

Mayer's Improved Holder Tank Construction.

On October 17th U. S. Letters Patent (No. 507,022) were granted to Mr. Frederick Mayer, of Baltimore, Md., for improvements in gasholder tank construction. Using the language of the specification:

The object of this invention is to construct a plate metal gasholder tank in such manner that the portion thereof at the water line when it shall have become injured by corrosion, may be removed and another substituted therefor; and the said invention consists, first, in providing the tank with a removable top rim extension, which can be easily replaced when corroded; and in providing means whereby the water line may be lowered during the substitution of the new for the old extension.

In the further description of the said invention which follows, reference is made to the accompanying drawings forming a part hereof, in which—

Figure 1 is a side elevation of a part of a gasholder tank provided with the present invention, certain parts of the tank being broken away to show the interior. Fig. 2 is an enlarged section of a part of the tank and its connections, and Fig. 3 is an enlarged exterior view of the same.

Referring to the drawings, *A* represents the gasholder tank proper having at the upper edge the top angle iron curb *b* and the platform *c*.

B is the top rim extension which consists of segmental plates *d* having the angle iron segments *e* and *f* at the upper and lower edges, respectively, and the angle iron connecting pieces *g*. These segments can, however, be formed of channel iron. The segments are connected by the bolts *h* and the same are united to the top curb *b* by bolts *j*. From this construction it will be seen that any one or any number of the segments may be easily removed and replaced by new ones. The segmental plates are preferably made of iron, galvanized, so that they may not be subjected to the same corrosion as are unprotected plates. The regular water level is represented by a dotted line marked *x*, and the regular overflow pipe is denoted by *z*.

At a proper distance below the platform the overflow pipe *k* is provided with a tee *m*, into which is screwed a nipple *n*, and between this nipple and another, *o*, attached to the tank by a flange *P*, is an ordinary globe valve *F*. On the inside of the tank is another flange *q* having a nipple *r*, and to this nipple is screwed an elbow *S* having a piece of pipe *t* which extends to the temporary water level denoted by a dotted line marked *z*. It will be seen that this temporary water level is below the top rim extension *B*.

Under ordinary circumstances, the globe valve *F* is closed and the overflow of water is by means of the pipe *k*. When, however, any part, or the whole of the rim extension becomes so corroded that it should be replaced by another segment, or an entire rim extension, the globe valve *F* is opened, when the water level is lowered to the line *z*. The overflow pipe or the portion thereof above the tee *m* is then detached and the injured segment or the whole top rim extension removed and replaced by another, when the valve *F* is closed and the water rises to the original level *x*.

It will be seen that with the invention described the life of a tank may be lengthened to almost any extent, as the only serious deterioration takes place at the water level.

The inventor's claim is: A gasholder tank having a removable top rim extension connected to the tank proper by flanges and bolts, the interiors of the said tank and the top rim extension being in communication and arranged so that water may flow from one to the other, combined with an overflow pipe, a branch overflow pipe with its upper end below the junction of the tank proper and the said top rim extension, and a valve in the said branch overflow pipe, substantially as, and for the purpose specified.

Fig 1.

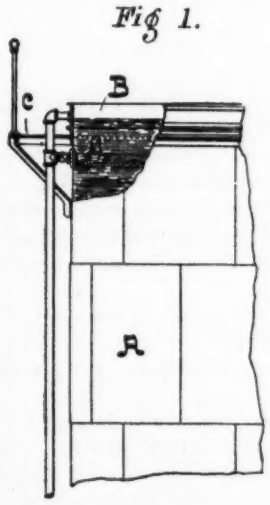


Fig 2.

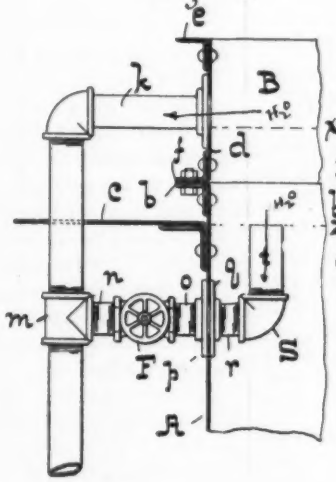
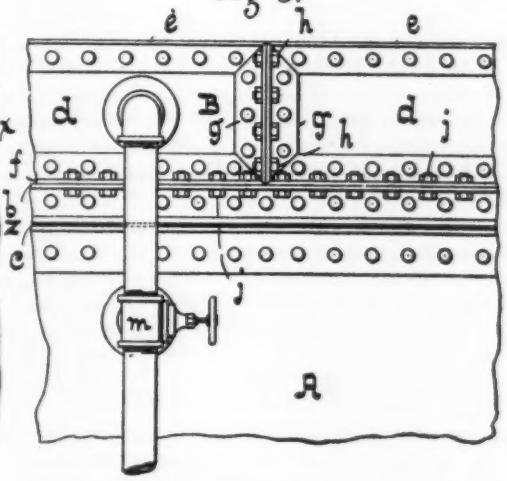


Fig 3.



The Flash Point of Petroleum.

In a paper recently read before the Society of Chemical Industry, Mr. D. R. Steuart raises objections to the low flashing point of lamp oils, as fixed by the Government regulations. According to these, the flash point must not be below 73° F., as shown by the close test, but Mr. Steuart would raise it to at least 100° F., which was the maximum flash point permitted under the old open test. Mr. Steuart points out that summer temperatures frequently exceed 73°, and argues that under such circumstances there is an explosive mixture over the oil in the reservoir of all lamps burning low flashing oils. Practically all the lamp accidents have, he finds, occurred with low flashing oils. Of 28 lamp explosions examined into by Professor Abel and Mr. Redwood, the flashing point in all cases was above the legal limit, and in half the cases more than 10° above, but in only one case had the oil a high flash point, and in this case the lamp was purposely designed in such a way that the oil in the reservoir was heated by conduction from the burner, with a view to making the oil burn better. Arguing from this, Mr. Steuart holds that the risk of explosion would be greatly reduced by the adoption of a higher flash test, and this is doubtless true. It remains to be seen, however, if the game is worth the candle.

Considering the thousands of lamps used, often by very ignorant and careless people, the percentage of explosions must certainly be extremely small, and to our mind this fact shows that the Government requirements are in practice amply sufficient, and that no adequate ground has

yet been shown for further legislative interference with a great industry. No case for such interference can be made out by laboratory experiments as conducted by Mr. Steuart. By means of experiments on lamps he found that under certain conditions the temperature of the oil may exceed the flash point, though actually this was not reached in any of his experiments, the outside temperature being low. Under these conditions an explosive gas is given off from the surface of the oil ; but experience seems to show that in practice the explosion does not take place save under very exceptional circumstances, and hence the laboratory experiments go for nothing. If Mr. Steuart wants the flash point raised, the proper way of going to work is by showing that these lamp accidents are much more frequent than is generally supposed, and even then it would be a moot point as to whether the change should not be made in the lamp rather than in the oil, as there is no question but that even naphtha can be burned safely in properly constructed lamps. In all such cases a middle course should be steered. Absolute safety may be bought too dearly.

Heating Boilers with Refuse.

Electricity remarks that an interesting scheme (which, if carried into effect, will be the first attempt on a practical scale to utilize house and town refuse in the heating of boilers for the production of electricity for illuminating purposes) is suggested by the engineers to the St. Pancras Vestry, which was the first local authority in London to establish a central electric light station on its own account.

At the present moment the Vestry's station is capable of supplying 10,000 incandescent lamps simultaneously, corresponding to 13,300 lamps installed, and of which 11,000 have been installed during the 18 months that the station has been in operation.

The prospects of the demand for light largely increasing are favorable, and the engineers suggest that a second generating station should be erected, and worked with great economy by the use of refuse destructors.

It is proposed that this station should be combined with, and be built on the same site, as works for collecting house and street refuse, the burning of such refuse and the utilization of the heat obtained from such burning for the generating of electricity and for other purposes. The principle of the destruction of refuse by destructor cells is now well recognized, and is being adopted by various local authorities in the United Kingdom.

The scheme provides for the laying down of generating plant to supply 4,800 lamps installed, ample space being allowed for future extensions. At the commencement, 3 engines of 200 horse power and 3 boilers would be installed ; the boilers would be heated by the gases from the destructors passing round the outer shell and escaping by the main flue, crossing under the front end of the boilers to the chimney. The power available from the destructors will not be less than 300 horse power, with the first installment of 3 boilers, and 500 horse power with a complete set of 5 boilers.

Arrangements are also provided for firing the boilers with coal in the usual manner by hand, or by the use of mechanical stokers, so that steam may be more rapidly raised to meet any sudden demand due to fogs and at times of maximum load. It is believed, if the scheme is carried into execution, as seems probable, that it would not only yield a remunerative return in the supply of light, but that the expenses incidental to the present method of disposing of the refuse would be considerably reduced.

Enrichment of Coal Gas by the Hydro-Oxy Process.

The *Gas World*, in referring to the trials now going on at Huddersfield respecting what is known as the hydro-oxy process of enriching coal gas, says :

Before describing the machinery employed, and recording the results obtained, we wish, in a line or two, to refer to a disagreeable point reflecting upon the conduct of certain gentlemen who have banded themselves together to supply two of the elementary substances supposed to be requisite for enriching purposes. It is almost needless to say that within the past three or four years the eyes of gas managers have been turned in the direction of oil as an enriching agent, and that within the same period several processes have been looming in the distance, or have been hovering above the horizon. The patentees of these systems have kept a watchful and a jealous eye upon each other. Not only so, but we are in a position to say that, in one particular case, subterfuges have been resorted to, which seem to be at variance with commercial honesty, to damn one particular system. In these days, however, commercial immorality is, to a large extent, regarded with indifference. The "grab-alls" are more numerous now than they were in the days when might was right, and if they do not use such dangerous weapons to "appropriate" other peoples' goods as they did long ago, their insidious modes of working have an equally baneful effect on the honest part of the community. Of them it may be properly enough said "they toil not, neither do they spin," and they may be likened to the beggar in Gil Blas, who, pointing his gun at the wayworn traveller, demanded alms "for the love of God." These lines are written so that they may meet the eyes of certain gentlemen whose conduct leads to the belief that a combination has been formed to foist upon the gas fraternity a process which is rotten to the core, and to oppose by all the means in its power another process which, seemingly, contains the elements of success. We have access to documentary evidence to justify what we have said. But leaving this unsavory subject aside, let us direct attention to the Huddersfield operations.

Early in 1890 British gas managers became aware, by the publication of the English patent specifications, of the somewhat bold proposal of Mr. Edward Tatham, of New South Wales, to add considerable quantities of pure oxygen to warm heavy oil gas, with the object of producing a stable gas of very high illuminating power. This oxy-oil gas was, later in the same year, brought more prominently before the gas world in a paper, communicated to the Gas Institute by Dr. L. T. Thorne, giving the results of preliminary experiments with this gas, carried out on behalf of Brin's Oxygen Company. In this paper, whilst belief was expressed in the ultimate employment of rich oxy oil gas as an illuminant *per se*, the more immediate prospect of its use for enriching gases of low or non illuminating power was pointed out.

Owing to the illness of the representative in England of the Australian Syndicate, to the difficulties inherent in introducing a totally new and rather startling process, and to other causes, there has been considerable delay in the development of the oxy-oil gas process in England. At length, however, a fair start has been made. Whilst the Hydro-Oxy Gas Patents Proprietary, Limited, have erected, at 11 Salisbury Square, London, E. C., a complete experimental plant for showing the process, and for enabling gas managers to make their own tests, plant is being put up by the Corporation of Huddersfield for the purpose of enriching the coal gas supplied to that borough.

Though the Huddersfield installation is not yet completed, part of it is in practical work ; and this new departure in enriching processes is of such great interest that we feel sure our readers will welcome the publication of results at the earliest possible moment, even though these results have been obtained under the necessarily adverse conditions of a new and hardly complete installation, and will therefore be subject to revision, and probable improvement, when the plant has been got into thorough working order.

The Huddersfield plant, when completed, will consist of an oxygen plant and four bays of oil gas retorts, capable together of a daily make of 200,000 cubic feet of oxy-oil gas, with the necessary adjuncts of condensers, holders, etc.

The oxygen plant, which is completed and in full working order, has been erected by Brin's Oxygen Company, and is their newest type of producer. It is built in two sections, which may be worked either together or separately, according to the exigencies of the gas output. This producer will make 30,000 cubic feet of oxygen per day, and is the largest oxygen producer ever yet erected.

Of the oil gas plant one bay, capable of producing about 50,000 cubic feet per day, has been erected and is now working. In this bay there are 15 cast iron retorts, 8 inches in diameter and 7 feet long, and having 5½ feet of heated length between the walls. These retorts are set with a very slight fall (about 1 inch) towards the back of the bay. The oil is fed into the retorts through 2 inch iron pipes passing through the front covers and terminating about half way along the retorts. These feed pipes are kept in duplicate and are fixed by clamp flanges. Thus when one becomes stopped it can be removed and replaced by its duplicate in about two minutes. The oil is supplied to these feeds by means of specially constructed siphons carrying floats so arranged that any back pressure—caused by stoppage in the feed pipe or pressure in the retort—at once raises the float, which in its turn shuts off the cock of the oil-supply pipe of that particular retort. Arrangements are also made for shutting off each row of retorts without interfering with the working of the other rows.

In the present setting the bottom (and hottest) retorts are arranged so as to be used for cracking the residuals from the upper retorts ; but they may, at will, also be fed with clean oil. The oil is cracked at a low red heat ; a canary-colored oil gas giving the best results under this process. The oxygen is admitted to the oil gas soon after the latter leaves the retorts, and whilst it is still warm ; the two gases then passing together through the condenser. The admission of the oxygen is controlled by specially coupled meters, supplied by Messrs. W. Parkinson & Co.

The meter registering the oxy-oil gas made is so coupled with a balanced oxygen meter that the oxygen is introduced into the oil gas in the proportion of 15 per cent. of the oxy-oil gas made. The admixture of oxygen is thus automatically adjusted to the quantity of oil gas being made; the working of the process is rendered very simple, the labor required being reduced to a minimum.

The intention is to run the oxy-oil gas into a special holder, from which it may be passed into the coal gas just before the station meter, the quantity being regulated, at the will of the manager, by a meter coupled with the station meter. At the time up to which our figures were taken the connections with this storage holder had not been completed, and the oil gas made had been passed direct into the main carrying the coal gas make from a portion of the works. Consequently no reliable tests of the illuminating power of the oil gas *per se* had been possible; but only of the enrichment produced on the coal gas.

In the 12 days during which the oxy-oil gas plant had been running, 244,600 cubic feet of oxy-oil gas had been made and run into the coal gas, the total quantity of enriched gas registered during this time being 4,103,000 cubic feet. Owing to the shortness of ordinary coal, on account of the strike, a large percentage of cannel coal had been used in the coal gas make, with the result that the average candle power of the unenriched gas was 18 candles. This high candle power would, as far as present experience goes, be against the process; and the enrichment of a poor coal gas would probably give higher results. The oxy-oil gas added increased this to an average of 23.5 candles, or 5.5 candles increase for 5.96 per cent. addition of oxy-oil gas. This is equivalent to an enriching value of about 109 candles per 5 cubic feet of oxy-oil gas.

Taking the whole amount of oil used during this trial (a proceeding against the process, as in the early stages of the working some oil was undoubtedly wasted and more tar made than would be the case in regular work), the yield of oxy-oil gas per gallon of oil used works to about 90 cubic feet. On this basis the effective enriching power works out at more than 1,900 candles per gallon of oil; a result which should secure for the gas the careful attention of gas managers.

With the experimental plant at Salisbury Square makes have been obtained of 100 cubic feet of oxy-oil gas to the gallon of oil, showing 95 to 100 candles on the bar photometer against the Methven screen; and it is believed that the gas made at Huddersfield has not yet been brought up to this, its full standard.

The coke made averaged about 50 lbs. to the ton of oil cracked—a *very* low figure in gas making. The residual tar was also very small, and the patentee believes that in continued practical working it will be reduced almost to nothing. In consequence of the small quantity of coke and tar produced, the retorts fed with clean oil required clearing only about every five days.

The question of the stability of oxy-oil gas, both *per se* and as an enricher, was some time ago carefully investigated by Dr. Thorne. It was also tested independently by Mr. W. R. Herring, the Manager of the Huddersfield Corporation gas works, when he was investigating oxy-oil gas before recommending to his Corporation its use as an enricher in place of cannel. Both of those gentlemen not only satisfied themselves on the practical permanence of the gas, but found that when used for enriching purposes it actually increases the stability of the enriched gas. The poor coal gas used in the experiments actually lost more illuminating power on keeping than the same gas enriched with oxy-oil gas did under identically similar conditions.

Turning to the question of cost, it is estimated that with oil ("solar distillate" of about 0.870 specific gravity) at $16.25 per ton—the figure now being paid for the small quantities which can be stored on the works at Huddersfield—and with oxygen at $1 per 1,000 cubic feet—including wear and tear, interest on plant, and special royalty payable under the hydro oxy agreements, at which price it should certainly be made with a Brin plant of the size of that at Huddersfield—the cost of oxy oil gas into the holder, including interest, wear and tear of plant, and royalty, should not exceed 93 cents per 1,000 cubic feet. As soon as arrangements for storage are completed the oil will certainly be obtainable at $13.75, if not lower; and this will reduce the cost of oxy-oil gas to about 81 cents. Calculating on the higher basis, the enrichment obtained at Huddersfield works out at less than 0.6 cent per candle per thousand cubic feet; and on the lower basis at ¼ cent.

This process is now also being introduced in foreign countries; and in America it has an especially favorable field. With the very low-priced oil obtainable in the United States, the Hydro Oxy Company is confident that it could manufacture a gas of, say, 80-candle power, free from smoke and sulphur, at a price even below the average cost of gas in that country—which would prove a very formidable rival to the electric light.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. E. F. Sherman, a son of Mr. F. C. Sherman, Superintendent of the New Haven (Conn.) Gas Company, will spend two months or more on the Pacific Coast, where he proposes to give much time to a study of the conditions governing the manufacture and distribution of gas in that section.

On the 11th inst. the final transfer of the property and franchises of the Richmond (Ind.) Gas Company to the Richmond Light and Power Company was formally made. The officers of the new enterprise are: President, Joseph E. Lewis, of Dayton, Ohio; Vice-President, J. M. Starr; Secretary, J. W. Roney; Treasurer, J. C. Reber. Dayton capitalists control the Company, the capital stock of which is $300,000.

"W. A. W." incloses the following from Boston, under date of the 21st inst.: "An interesting ruling was recently made by the full bench of the Massachusetts Supreme Court, in the case of the Merchants National Bank, of Gardiner, Maine, against the Citizens Gas Light Company, of Quincy, Mass., which was an action on a promissory note of $600, given in the name of the defendant by C. S. J. Ruggles as its Treasurer. The defendant denied that Ruggles was its Treasurer, and claimed that he had no authority to give notes. The note was discounted by the plaintiff in the usual course of business, without notice that the legality of the election of Ruggles as Treasurer was questioned. The Court says: 'Upon consideration of the decisions we think it fair to say that the making and indorsing of negotiable paper is to be presumed to be within the power of the treasurer of a manufacturing and trading corporation wherever, from the nature of its ordinary business as usually conducted, the corporation is naturally to be expected to use its credit in carrying on commercial transactions. It is no less for the interest of all that if negotiable paper is to be employed, its validity should not be open to objections which would impair its usefulness, by requiring at every step an inquiry into the authority by which it is issued.' The Court further holds that gas and electric light companies should be classed as manufacturing and trading corporations, and be governed by the general rule applicable to such corporations. A majority of the Court finds that the jury was rightly instructed, that the Treasurer of the defendant Company, by virtue of his office, had authority to sign a note which would bind the corporation. In a dissenting opinion by Chief Justice Field, with whom Judge Allen concurs, it is held that the instruction to the jury was erroneous."

The Board of Gas and Electric Light Commissioners of Massachusetts has before it the evidence submitted at a hearing called to determine whether or not the rate charged ordinary consumers for incandescent electric lighting by the Malden Electric Company was excessive. The Company charges 1½ cents per lamp (16 candle power) per hour, and the petitioners are endeavoring to secure an order reducing the charge to 1 cent per hour. There was nothing novel brought out by the testimony, unless it was that the Company made out a strong case in point of showing that it could not make both ends meet if the petitioners were successful. The Commissioners have the matter under advisement.

The Berlin Iron Bridge Company advises us that the new meter house for the East River (N. Y.) Gas Company will be entirely of iron and brick. The roof trusses are to be of iron covered with corrugated iron and glass as designed by the Berlin Company.

The following presentation of affairs gaseous at Bellefontaine, Ohio—the plant there is operated on municipal account—is from a local paper "The Gas Trustees ask a vote on the question of levying a tax to put in a new gasholder and to extend mains. It would be foolish to vote down this proposition without good reason. If the improvement is necessary, and will make the works more profitable, the money should be freely voted. It is not a question whether the works have already paid, but having reached a point where they are becoming profitable, should they not be put in the most efficient condition. A man who had put up a house as far as the roof, and had expended what he thought would complete the house, would not hesitate to borrow enough money to complete it; nor would he hesitate to put needed repairs on it. If our city would sell its gas works to a private company and grant them the privilege of charging the same rate for gas that is charged consumers in other cities, our works could be sold at once for every dollar that the city has put into them. This shows that the plant has not depreciated in value. And when we say this we mean not only that they could be sold for the original value of the works ($32,600), but for the money that the town has

since put in, in extending mains, building coal houses, Askins plant and all. The Trustees now ask $7,500 to build a new holder and $7,500 to extend mains to taxpayers who have been paying for improvements on the works, but could never get gas. The original number of consumers was less than 200; it is now 600 or more, and the increased demand has made another holder necessary. If it is built it will enable the Trustees to make enough gas, under the Askins process, during the day to meet the supply, and thus effect quite a saving. A new holder is therefore not only a necessity, but good policy; and an extension of the mains will not only increase the number of consumers, but it will be doing justice to taxpayers who want gas but cannot get it without an extension of mains. One of three things is necessary. First, either sell the works and have private consumers, churches, etc., pay from 50 to 100 per cent. more for gas; second, go into winter without enough gas to light the streets, churches, stores and residences properly; or, third, make the necessary improvements called for. The lighting of the streets and public offices has paid the interest on the original investment in the works. The plant has nearly doubled in value, and the improvements asked will be permanent and economical, and a paying investment. The amount our citizens have had to pay for gas has been at least $100,000 less than they would have had to pay a private company, thus saving to them this large sum. The Askins plant is not a failure, but gas is made under it cheaper than under the old process, and the saving will be considerably more with a new holder. Extension of mains will bring in new consumers and add to the revenue. Finally, there have been unnecessary and misleading statements as to what the town has already invested in the works. When the works were built they cost $32,600, but they were not complete, and some $6,000 had to be expended at once to complete them. The number of consumers at first was small, and the outlay for a number of years exceeded the expenses; but for some 10 years the balance has been in favor of the works showing that the consumption is now large enough to make the works profitable. The total money given to the works by the town since they were built, including the $6,000 added to the works at first, and $10,000 paid for the Askins plant, has been only $25,300, or a little over $1,000 a year, and for this the town has value received in the present value of the plant. The capacity of the works to pay their expenses and their value, as well as the desirability of retaining town ownership of them and improving them, should not be judged for what they did for the first 10 years, when they had few customers, but for the last 10, when they paid expenses. Every man who uses gas, every man who wants gas, every man who has it in his house or store, every man who wants it in his church, is interested in the question of keeping the works out of the hands of a private company. The bonds that are to be issued are not to be paid for 20 years, and the taxpayer of to-day would have to pay the interest only, amounting to about $900 a year for all the property holders in Bellefontaine."

THE proprietors of the St. Johns (Mich.) Gas Company and those of the St. Johns Electric Light Company have arranged a plan for the consolidation and joint operation of the named enterprises.

MR. WILLIAM W. SILKWORTH, Superintendent of the Fishkill and Matteawan (N. Y.) Gas Company, has been authorized to enter into a contract with the New Jersey Light and Power Company, under which the latter will construct at Fishkill a generating plant. It is also proposed to make a liberal addition to the distributing mains.

THE Gas Light and Coke Company, of New Albany, Ind., has filed suit in the Supreme Court against the city of New Albany. In its complaint the Company says that in 1870 an agreement was entered into with the city, by which the Company was to furnish for 20 years gas for street illumination at $18 a lamp a year. In 1888 the City Council passed an ordinance reducing the price of gas, and an agreement was made with the Company that the latter should have the privilege of lighting the city when electricity was substituted for gas. The Company says that it put in an electric plant and made preparations for changing the lights, but that since then the city has advertised for bids. The Company asks that the city and the Mayor be enjoined from receiving bids from other Companies, and that they be perpetually enjoined from entering into a contract with other Companies for furnishing electric lights.

MR. CHARLES D. WOODRUFF has been appointed Superintendent of the Brookline (Mass.) Gas Light Company, vice Mr. Charles S. Spaulding.

ON the 21st inst, Presiding Judge Thayer, of the Common Pleas Court of Philadelphia, granted a preliminary injunction against the city and the Receiver of Taxes, John Taylor, restraining the collection of taxes levied upon the real estate at Flat Rock, in the 21st Ward of Philadelphia, which property is owned by the West Manayunk Gas Light Company. The bill in equity upon which the injunction is based sets out that the real estate in question is necessary for the enjoyment by the Company of its franchises in supplying gas to customers in Manayunk and Montgomery county; that the real estate is part of its capital stock, and is therefore not liable to taxation for county and municipal purposes. The case, which is attracting much attention in Philadelphia, will be argued in a few days.

"OBSERVER" sends the following respecting a recent happening in Fall River, Mass.: "The Merchants mill at Fall River is lighted by gas made in a plant owned by it on Tremont street, and gas is also supplied from the same plant to the Crescent mill on Pleasant street. The waste water, etc., from the works is run into the public sewer through Tremont street, and complaint has been frequently made that the drip from the works is frequently responsible for explosions that have more or less seriously injured the sewer system. The attention of the Board of Aldermen having been called to the danger involved ordered that the Company cease draining into the sewer, but the Manager of the mill (Mr. Borden), having asserted that this would necessitate the shutting down of the mill, the order was revoked, and the City Engineer was directed to investigate the matter and to report whether it was safe to permit the sewers to be used by the mill under the practice followed. That official subsequently reported he 'considered the connection a menace to life and property,' and the Aldermen thereupon gave the officials of the mill 48 hours to sever the connection."

THE following is from the Philadelphia *Record* of the 24th inst.: "After an exciting discussion of two hours, Councils' Committee on Gas yesterday voted to recommend an ordinance to fix the price of gas at $1.25 per 1,000 cubic feet. This action was taken after it had been explained that in order to fix the price to consumers at $1.25 the city must make an appropriation of about $775,000, ostensibly to pay for city lighting, but in reality to extend and improve the gas works. According to Director Windrim's figures, at $1.25 per 1,000 the department will be $240,000 short, even after the city has paid for public lighting at $1.25 per 1,000, the same as private consumers pay. The matter came up on a motion by Mr. Clay to report favorably an ordinance to fix the price at $1.25. Mr. Miller, of the First Ward, moved to amend by fixing the price at $1. After Mr. Smithers had explained that the Controller had stated that in order to reduce the price to $1.25 Councils would have to make an appropriation to pay for the public lighting, Mr. McMurray claimed that the reduction was a misrepresentation; that it might reduce the price to the private consumer, but that it increased the expenditures out of the general taxation. 'In other words,' he said, 'it is robbing Peter to pay Paul.' This brought Mr. Crowell into the discussion. He claimed that last year the city made out of the gas works over $1,000,000 and did the public lighting free, at $1.50 to the private consumer. He thought the city could well afford to reduce the price to $1 per $1,000 and still have a profit. It had been stated by General Manager Bodine, of the United Gas Improvement Company, that his Company could deliver into the holders, by using the city gas plant, gas at 37 cents per 1,000, the same price as it now sells water gas to the city. Mr. Crowell said: 'If a private corporation can furnish this gas at 37 cents, and we can't make it and furnish it to the city free for less than $1.50, why we had better let a private corporation do our lighting than keep a crippled old horse in the stable, when it is no longer able to work. If gas is reduced to $1 everybody will use, where only one-half the people use it now.' Mr. Crowell then brought out the fact that coal and water gas, mixed, now costs 53 cents per 1,000 to put in the holders and 40 cents to distribute, making 93 cents per $1,000. Director Windrim here explained, however, that there is 13 per cent. leakage to be taken into consideration. There was considerable more discussion, in which Chairman C. K. Smith took the ground that it was poor policy for the city to make a radical reduction in its revenues, when it had to borrow money for public improvements. Mr. Clay then presented a calculation showing that with the reduction to $1.25, and including an appropriation to pay the public lighting at $1.25, based on the receipts of last year and the estimated increase of consumption for next year, there would be a reduction in receipts of $240,000. A vote was then taken on Mr. Miller's amendment, putting the gas rate at $1, and the proposition was rejected by a vote of 11 against to 6 for. On Mr. Clay's motion for a $1.25 rate the vote was reversed, the proposition to recommend that figure to the whole Council being adopted by 12 to 5. Previous to the meeting of the General Committee the Sub-Committee met to consider the ordinance

introduced by Mr. Meehan for the purchase of the Twenty-fifth Ward water gas plant. The city has entered into a contract with the United Gas Improvement Company, for $600,000 worth of water gas at 37 cents per 1,000 cubic feet. Mr. Meehan thought the city could make its own water gas for at least 20 cents per 1,000 cubic feet, but gracefully admitted that he was not an expert when questioned as to the cost of materials and labor and the character of machinery. Mr. Samuel T. Bodine, General Manager of the United Gas Improvement Company, presented a long statement to show that the city could not make its water gas as cheap as it buys it. In reply to a question, Mr. Bodine said that his Company stood ready to take the city gas works, make all necessary improvements and extensions, and put the coal gas in the city holders for 37 cents per 1,000. Director Windrim said he failed to see how Mr. Bodine's Company could manufacture coal gas at such a price, as the city could purchase supplies as cheaply as a corporation. The Director thought that if the city continued to purchase gas without providing for the manufacture by itself, it would be giving to a private corporation for nothing that which it refused to sell a few years ago for $25,000,000. Mr. Clay also thought the city had made a great mistake in not selling the gas works for $25,000,000 when that sum could have been obtained for them. On Mr. Murray's motion, further consideration of the matter was postponed until such reasonable time as the Committee could visit the water gas plant for the purpose of securing thorough information regarding it."

MR. C. D. BLAUVELT has been appointed Superintendent of the Calumet Gas Company, of South Chicago.

AT the annual meeting of the Citizens Gas Light Company, of Wakefield and Reading, Mass., the following officers were chosen: Directors, E. H. Capen, H. C. Buck, J. B. Dillingham, P. A. Underwood, A. L. Marriner and L. R. Wallis; President, Edward H. Capen; Treasurer, H. C. Buck; Clerk, L. R. Wallis.

SOME days ago George Babson, as President, and Oliver H. Perry, as Treasurer, representing a new incorporation entitled the Chelsea Fuel Gas and Heating Company, petitioned the Aldermen of Chelsea, Mass., for permission to open a part or all of the streets of the city for the purpose of placing gas mains for supplying the residents with gas for fuel and heating purposes.

THE works of the Bridgeport (Conn.) Gas Light Company were in very dangerous proximity to a fire that broke out some days ago in the storehouses of the Housatonic Ice Company. The firemen, however, managed to save the buildings, the eaves of which were in flames more than once. The damage was about $250.

ON October 20 Mr. Henry C. Rew, of Chicago, filed a bill in the Circuit Court in which he asked that the Chicago Gas Light and Coke Company be enjoined from shutting off the supply of gas from his residence, No. 2619 Prairie avenue, and to have the Court fix a reasonable and fair price for the consumption of gas manufactured by that Company. The bill was taken before Master in-Chancery Decker, and upon the Master's recommendation Judge Tuley issued the writ prayed for. The principal charge in the bill is that the defendant corporation is an offspring of the Chicago Gas Trust, which has been declared illegal by the Supreme Court. It is asserted that the new corporation, merging out of the ruins of the Trust, has endeavored to keep up the price of gas, there being no competition in Chicago because of the fact that the four large Gas Companies of the city have been consolidated into the Chicago Gas Company, thereby securing the same ends as were obtained when the Trust was in existence. The franchise by which the Company secured its charter is set up and the bill then proceeds to relate the history of the corporation. The complainant says that the larger the volume or the amount of gas production the cheaper should be the cost in a case where the increase of gas manufacturing and sale has not required the larger proportionate number of miles of gas mains. Mr. Rew accounts for the small amount of increase in the extension of mains in the fact that great numbers of office buildings have been erected in districts supplied by the corporation, by which the capacity of the buildings which took the place of former structures standing upon the same ground was enormously increased, thereby enabling the defendant to make larger sales of gas to the occupants of buildings without extending the mains. The combination which was made in 1887 for the consolidation of four of the largest Gas Companies in the city and merging their stock into a Trust is referred to. The Peoples Gas Light and Coke Company, the Consumers Gas, Fuel and Light Company, the Equitable Gas Light and Fuel Company, and the defendant corporation were merged into the Chicago Gas Trust Company, April 28, 1887, it is alleged. Prior to the 1st day of June of this year the corporation charged its consumers at the rate of $1.15 per 1,000 cubic feet for gas used as fuel, and not less than $1.20 for illuminating purposes. The gas bill of the complainant for the month of June amounted to $19.20, and the 27th of July he claims he received notice from the Company that if the account was not settled before July 28 the supply of gas would be shut off. He paid the bill under protest, but the bill of September, which amounted to $18.94, has not been paid by the complainant, who maintained that he is under no legal liability to settle the bill because the corporation is in the combination referred to. Complainant, who is President of the National Gas and Water Company, of Chicago, is interested with others in obtaining a franchise for an opposition Company in Chicago, the application for which is now before the authorities of that city.

MR. C. T. FROST, formerly Superintendent of the Rockland (Me.) Electric Light and Power Company, has been chosen Superintendent of the Knox Gas and Electric Company, which corporation is the result of a consolidation of the gas and electric lighting interests of Rockland and Thomaston.

THE capital stock of the Mutual Fuel Gas Company, of Chicago, is to be increased.

A RESOLUTION was recently introduced in the City Council by Alderman McCulloch which instructs the Committee on Fuel and Street Lights to confer with the Gloucester (Mass) Gas Light Company for the purpose of securing a reduction in the gas rate.

SOME time ago a reporter of the Boston *Journal* interviewed Chairman McDonald, of the State Board of Gas and Electric Light Commissioners, as to the candle power and purity of the gas supplied by the Brookline Gas Company, which the reporter thought was deficient in each respect. The Chairman's reply was: "The Board has had the gas of the Brookline Gas Company inspected by State Inspector Jenkins every month since the beginning of the year. The result of these regular inspections showed the highest candle power to have been 19.2 and the lowest 16.6, giving an average of 18.5. The last inspection was made on the 12th inst., and it showed 18.5. Last year the Brookline candle power averaged 17.81, while the average of the coal gas companies throughout the State was 17.60. The per cent. of impurities is comparatively small in the gas of the Brookline Company, and the reports of our Inspector show that the quality of the gas furnished is excellent. I understand that the Brookline Company is still making coal gas, its water gas plant not being yet in working order."

THOMAS SULLY, a New Orleans (La.) architect, has ordered from the Berlin Iron Bridge Company, of East Berlin, Conn., an iron roof for a sugar house at Tampa, Fla. The building will be 60 feet in width and 125 feet in length, the trusses to be entirely of iron covered with corrugated iron.

MR. DENNIS LONG, known to the gas world for many years as the President of the pipe works at Louisville, Ky., which bears the name of Dennis Long & Co., died at his home in that city early this month. He was born in Londonderry, Ireland, in 1816, and came with his parents to this country in 1820, when they settled at Erie, Pa. He subsequently learned the trade of moulder, at Pittsburgh, and about 1842 went to Louisville, Ky., associating himself with the late Bryan Roach in the business of making cast iron gas and water pipes. It is notable that the first pipes used by the old St. Louis (Mo.) Gas Company were manufactured by Long and Roach. He was President of the Louisville and Jeffersonville Bridge Company. His estate is valued at $1,000,000.

DURING a severe storm of rain and wind the retort house of the Citizens Gas Company, of Buffalo, N. Y., partially collapsed. The damage is put at $11,000.

DOCTOR COGGSWELL, of San Francisco, who is somewhat known to fame in the East as the giver to Brooklyn, N. Y., of a public drinking fountain, the design of which was so hideous that the authorities eventually ordered its dismantling, thinks he was the victim of a conspiracy, through having been induced to purchase large holdings in the Pacific Lighting Company, of San Francisco, when these shares were at 85 per cent. or thereabouts. The Company was then paying good dividends, but shortly after the Doctor "got in" the dividends ceased. He thinks the whole scheme was a swindle, and asks that he be allowed to examine the books. Meanwhile the officers of the Company, who are men of undoubted repute, are preparing to take the Doctor to task in the courts for his statements.

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AND GENERAL SCIENCE

MONDAY, OCTOBER 30, 1893.

The Market for Gas Securities.

Our prediction of a week ago regarding the speedy likelihood of a sharp advance in Consolidated gas was quickly verified, the net increase for the 7 days having been 4 points. The opening bid price to-day (Friday) was 136, holders demanding ½ point higher. The new holder construction, which increases the Company's storage capacity about 6½ millions cubic feet, is well on to completion, and its use will make a marked economy in the matter of meeting the needs of consumers during the times of heaviest consumption this winter. Mutual gas also experienced a sharp upward turn, 140 being bid for it on all sides, but holders refuse to accept less than 145. Equitable shows no change, although a very slight inquiry for the shares would send them above 180.

The Brooklyn situation is in an unclarified state, notably in the instance of the goings on in the Eastern District, where the wonderful "executive ability" wrigglings of those in charge of the Williamsburgh Company's affairs are the talk of the town, even transcending the question of whether it is to be Boody or Schieren for Mayor. The rumors respecting a receiver for the Equity menagerie are only rumors. No positive legal steps in this direction have yet been taken. Chicago gas is buoyant at 68½ to 68⅝; Bay State is in demand, at 18 to 18¼; Baltimore Consolidated is very strong, at 60 to 60½, and Laclede common is worth 16¾. The Denver Consolidated Company has declared a quarterly dividend of 1 per cent., payable November 10.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,
16 WALL ST., NEW YORK CITY.

OCTOBER 30.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share. ☜

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	136	136½
Central	500,000	50	90	95
" Scrip	220,000	—	—	100
Equitable	4,000,000	100	170	175
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	108	112
Mutual	3,500,000	100	140	145
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	80	95
" Bonds	150,000	—	—	100
Richmond Co., S. I.	346,000	50	50	65
" Bonds	20,000	—	—	—
Standard Gas Co—				
Common Stock	5,000,000	100	—	32
Preferred	5,000,000	100	60	65
Yonkers		50	112	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	—	105
Citizens	1,200,000	20	50	55
" S. F. Bonds	320,000	1000	—	101
Equity Gas Light Co.	2,000,000	100	—	—
Bonds	1,000,000	—	25	40
Fulton Municipal	3,000,000	100	120	—
" Bonds	300,000		103	—
Peoples	1,000,000	10	—	75
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	98	100
Metropolitan	870,000	100	115	120
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	140	—
" Ctfs.	700,000	1000	99	100
Williamsburgh	1,000,000	50	125	—
" Bonds	1,000,000	—	107	110
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	75	—
2d " " "	3,000,000	1000	—	58
Bay State Gas Co.—				
Stock	5,000,000	50	18	18¼
Income Bonds	2,000,000	1000	40	—
Buffalo Mutual, N. Y.	750,000	100	110	—
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
Chicago Gas Company.	25,000,000	100	68⅛	68⅝
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	81⅛	81½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	101
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	108
2d "	2,500,000	1000	104	105
Consumers Gas Light Co., Jersey City	2,000,000	100	—	30
Bonds	600,000	1000	—	85
Cincinnati G. & C. Co.	7,000,000	100	192	—
Consumers Toronto	1,600,000	50	184½	187
Central, S. F., Cal.			—	100
Capital, Sacramento, Cal			—	55
Consolidated, Balt.	11,000,000	100	60	60⅛
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	101
Bonds	250,000		—	—
Detroit Gas Co.—				
1st Mortgage			40	60
East River Gas Co., Long Island City	1,000,000	100	—	—
Bonds	500,000	100	86	87
Hartford, Conn.	750,000	25	120	128
Jersey City	750,000	20	190	200
Laclede Gas Light Co., St. Louis, Mo.—				
Common Stock	7,500,000	100	16¾	17
Preferred "	2,500,000	100	70	—
Bonds	9,034,400	1000	71	71½
Louisville, Ky.	2,570,000	50	125	130
Little Falls, N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	200	208
Memphis (Tenn.) Gas	750,000	100	30	—
" Bonds.	240,000	100	103	—
New Haven, Conn.		25	200	—
Oakland, Cal.			42⅝	43
Peoples, Jersey City		—	160	170
" " Bonds.			—	—
Paterson, N. J.		25	99	102
Rochester, N. Y.		50	80	85
Preferred			90	95
Bonds			90	95
Syracuse, N. Y.	500,000	25	—	—
San Francisco Gas Co. San Francisco, Cal.	10,000,000	100	71½	72¼
Washington, D. C.	2,000,000	20	240	240
Wilmington, Del.		50	59	88

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In addition to a full assortment of Volumetric Governors, etc., I am now making **MERCURY PRESSURE GOVERNORS** of all the usual sizes, adapted to use upon *Gas Stoves, Furnaces, and Meters.* The same careful attention to details of design and workmanship which has established the reputation of **WILDER'S VOLUMETRIC GOVERNORS** will be given to the new line. They have been thoroughly tested in many places during the past year, and have given entire satisfaction. The price is very low, and but for a complete system of machinery adapted to this work, it would be impossible to sell them at the price. I hope for large orders, as they become known, in consequence of the low price and good quality.

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MANUFACTURERS OF

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SEND FOR CIRCULAR.

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ALSO,

Hydraulic Main Dip Regulators, Check Valves, Foot Valves, Yard Wash and Fire Hydrants.

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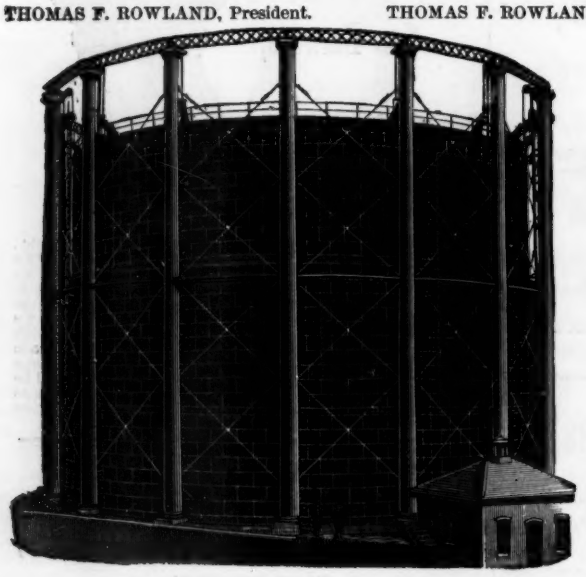

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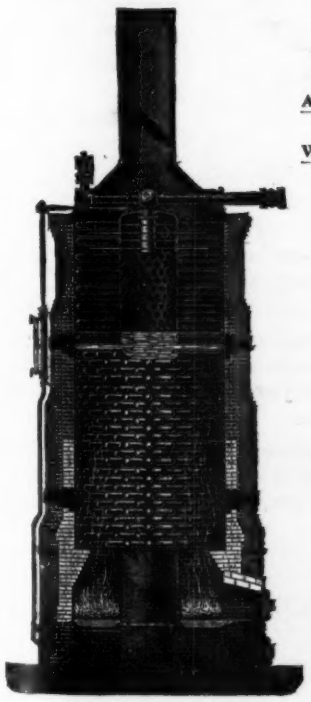

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TRADE MARKS.

Special Sectional Boilers For Export.

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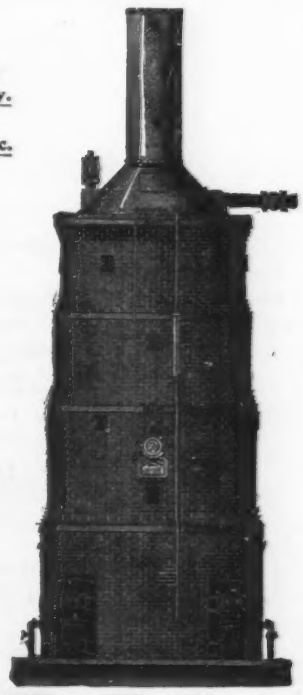
This Company is prepared to Manufacture and Furnish Plants of Boilers of any desired capacity, and will forward proposals and other information on application. All imitations of the substantial features of this Boiler are infringements, and will be prosecuted to the full extent of the law.



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Cable Address, "PAILA," NEW YORK.

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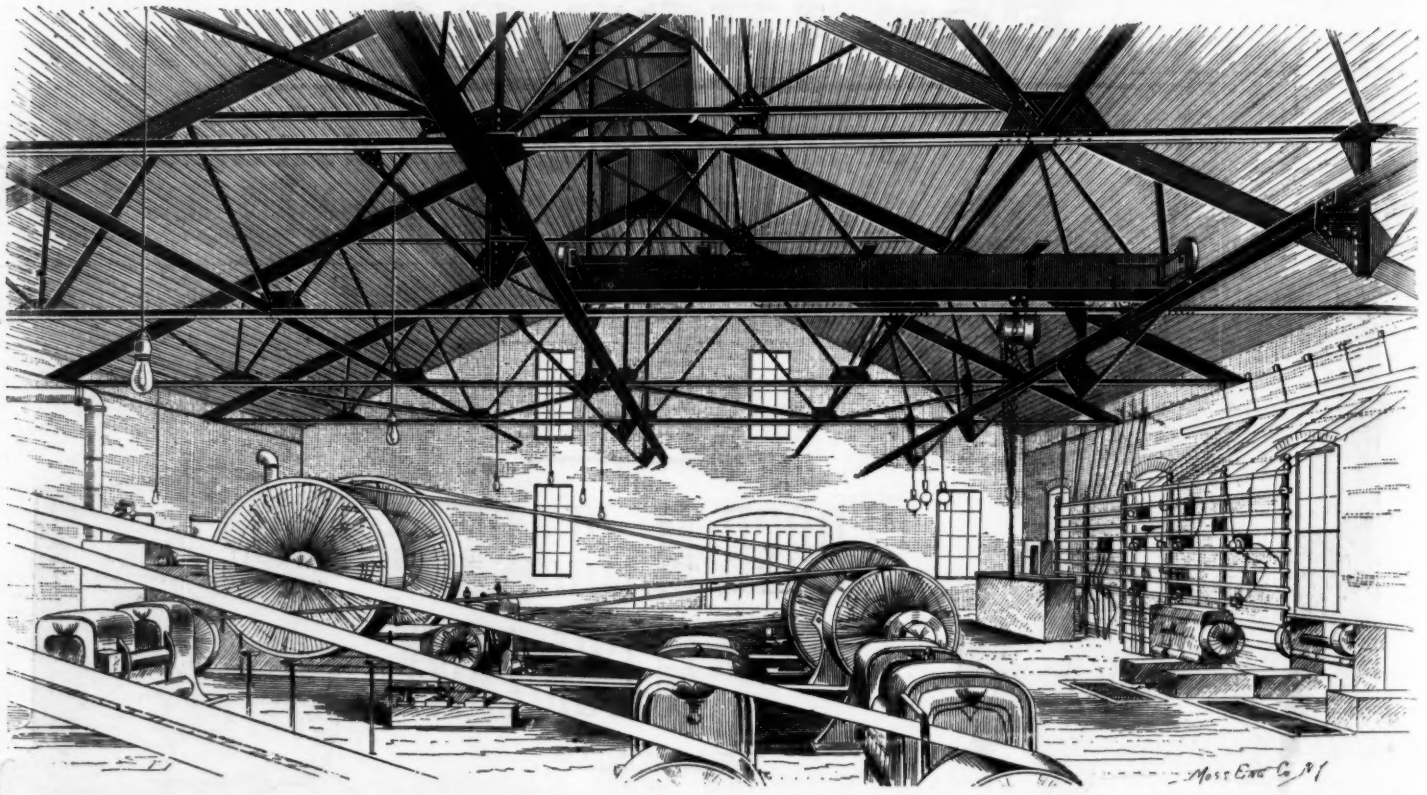

The above illustration is taken direct from a photograph, showing the interior of a Dynamo Room, the Roof of which was designed and built by us for the Norwalk and South Norwalk Electric Light Company, at Norwalk, Conn. The building is 60 ft. in width and 70 ft. in length. The dynamos are moved by a traveling crane of 4,000 pounds capacity, supported by the roof trusses as shown in the illustration, thus greatly facilitating the placing and replacing of the machinery.

Write for Illustrated Catalogue.

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HIGH CANDLE POWER

FROM

GAS.

MR. WALTON CLARK, Assistant General Superintendent, United Gas Improvement Co.:

Dear Sir—In accordance with your request, I have made several ests of the new Welsbach mantel (called No. 169) for candle power and efficiency, and I herewith submit the following results:

	Candle Power.	Pressure.	Gas Consumed.	C.P. per Cu. Ft.
Average of Test No. 1,	67.05	.95 in.	2.6	25.70
" " No. 2,	63.86	1.00 in.	2.86	22.30
" " No. 3,	72.50	2.1 in.	2.87	25.26

The above averages are the results of trials on three different occasions, and in each case the mantles tested were made from a different lot of fluid.

The mantles used in the above tests were selected at random, and all had been dipped in kristaline and dried ready for shipment.

It is quite possible that better results could have been obtained by manipulating and readjusting the position of the mantles on the galleries, and also by waiting a longer period after burning off the kristaline; but I considered such fine adjustment undesirable in determining the commercial candle power.

These tests were made on a bar photometer against a regular Edgerton standard slit. The candle power of the slit was 6.18, and the gas used was Gloucester City water gas, 26 candle power.

Very truly yours,
(Signed) C. H. PAGE, JR., M.E.

WE ARE NOW PREPARED TO FILL ALL ORDERS PROMPTLY FOR

HIGH CANDLE POWER WELSBACH LIGHTS.

Gloucester, N. J. **WELSBACH LIGHT CO.**

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The present (the fifth) edition marks an important advance on those that have gone before. Considerable additions have been made to the text and much of it has been rewritten and otherwise improved. Price, cloth, $6.

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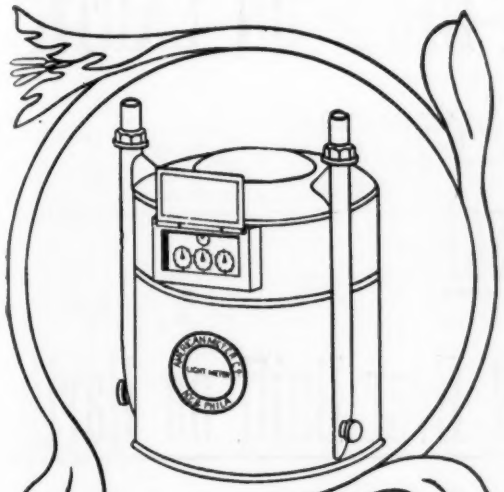

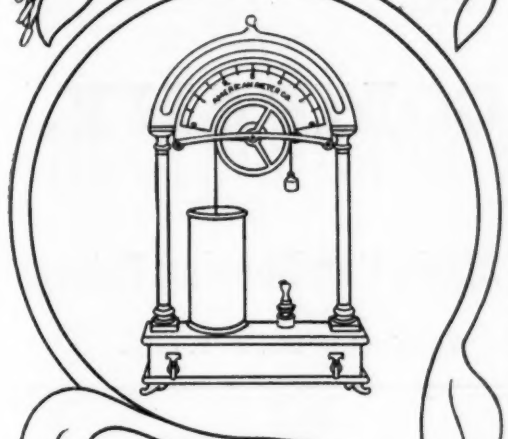

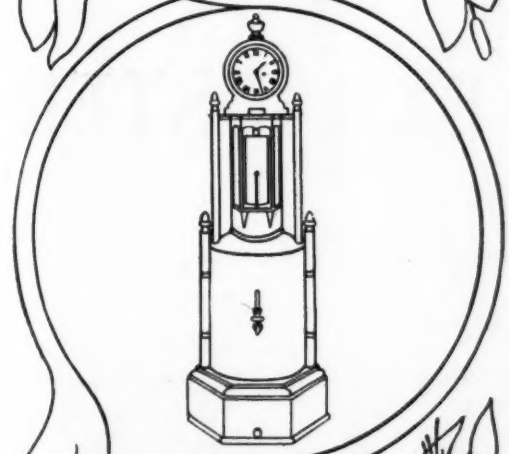

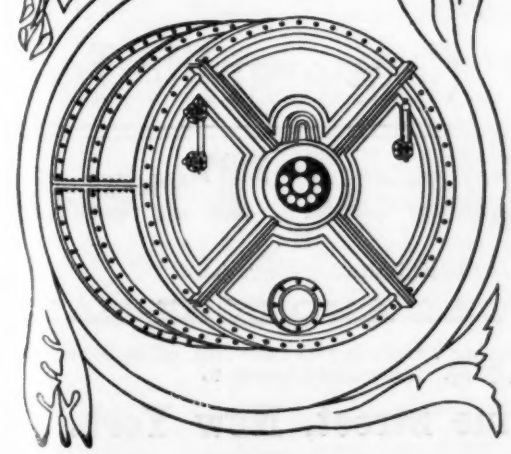

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NEW YORK and PHILADELPHIA.

CHICAGO, CINCINNATI,

ST. LOUIS, SAN FRANCISCO.

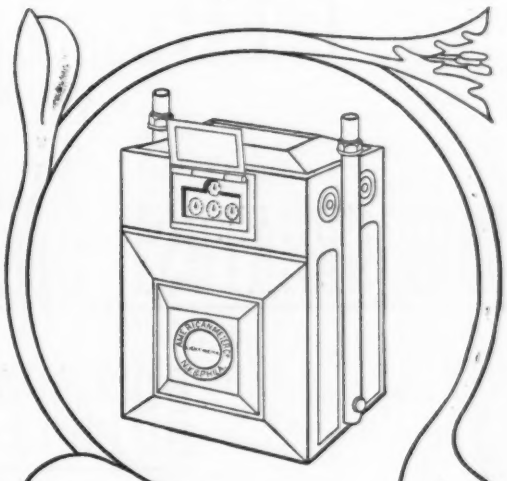
PUBLIC LIGHTING TABLE.

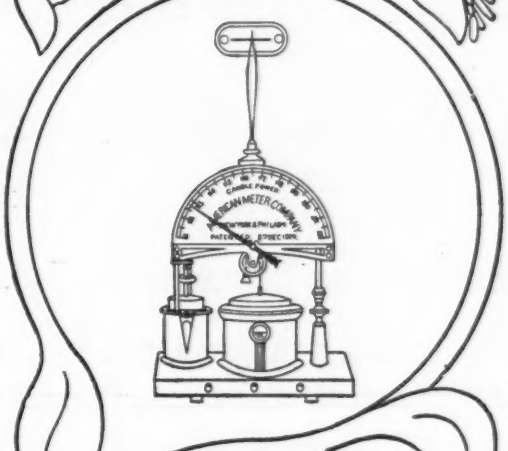
NOVEMBER, 1893.

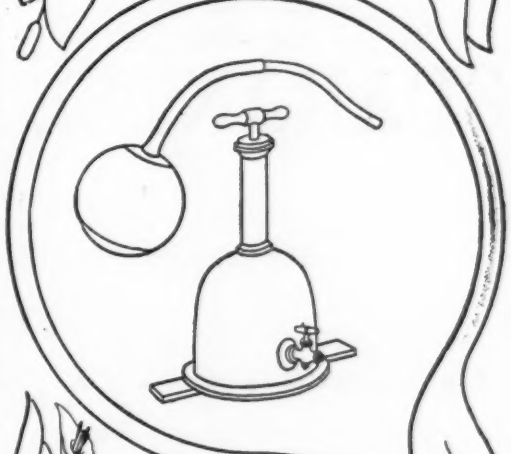
Day of Week.	Table No. 1. Following the Moon.				Table No. 2. New York City. All Night Lighting.	
	Date.	Light.		Extinguish.	Light.	Extinguish.
					P. M.	A. M.
Wed.	1	5.30	PM	1.10 AM	4.45	5.35
Thu.	2	5.30		2.20	4.45	5.35
Fri.	3	5.30		3.30	4.45	5.35
Sat.	4	5.20		4.30	4.45	5.35
Sun.	5	5.20		5.40	4.40	5.45
Mon.	6	5.20		5.40	4.40	5.45
Tue.	7	5.20		5.40	4.40	5.45
Wed.	8	5.20	NM	5.40	4.40	5.45
Thu.	9	5.20		5.40	4.40	5.45
Fri.	10	5.20		5.40	4.40	5.45
Sat.	11	5.20		5.40	4.40	5.45
Sun.	12	5.20		5.40	4.30	6.00
Mon.	13	7.30		5.40	4.30	6.00
Tue.	14	8.30		5.50	4.30	6.00
Wed.	15	9.30		5.50	4.30	6.00
Thu.	16	10.40	FQ	5.50	4.30	6.00
Fri.	17	11.40		5.50	4.30	6.00
Sat.	18	12.50	AM	5.50	4.30	6.00
Sun.	19	2.00		5.50	4.25	6.00
Mon.	20	3.10		5.50	4.25	6.00
Tue.	21	4.30		5.50	4.25	6.00
Wed.	22	No L		No L.	4.25	6.00
Thu.	23	No L	FM	No L.	4.25	6.00
Fri.	24	No L		No L.	4.25	6.00
Sat.	25	5.10	PM	7.20 PM	4.25	6.00
Sun.	26	5.10		8.30	4.20	6.10
Mon.	27	5.10		9.50	4.20	6.10
Tue.	28	5.10		11.00	4.20	6.10
Wed.	29	5.10		12.10 AM	4.20	6.10
Thu.	30	5.10	LQ	1.20	4.20	6.10

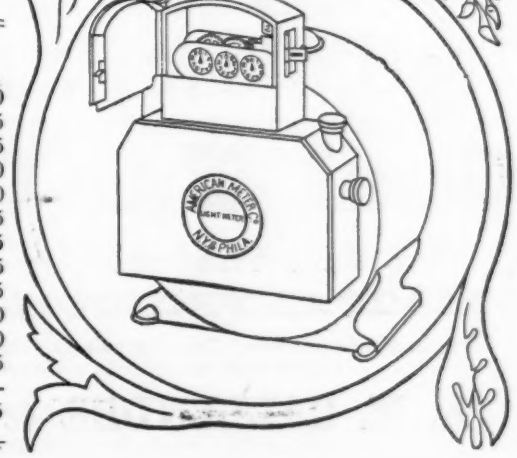
TOTAL HOURS LIGHTING DURING 1893.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January...	217.30	January...	423.20
February..	200.30	February..	355.25
March	177.50	March	355.35
April.....	160.30	April.....	298.50
May.....	149.00	May.....	264.50
June.....	140.30	June.....	234.25
July.....	143.40	July.....	243.45
August....	154.50	August....	280.25
September.	171.50	September.	321.15
October....	202.20	October....	374.30
November.	221.30	November.	401.40
December.	248.50	December.	433.45
Total..	2188.50	Total..	3987.45









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HAS AWARDED A MEDAL AND DIPLOMA TO

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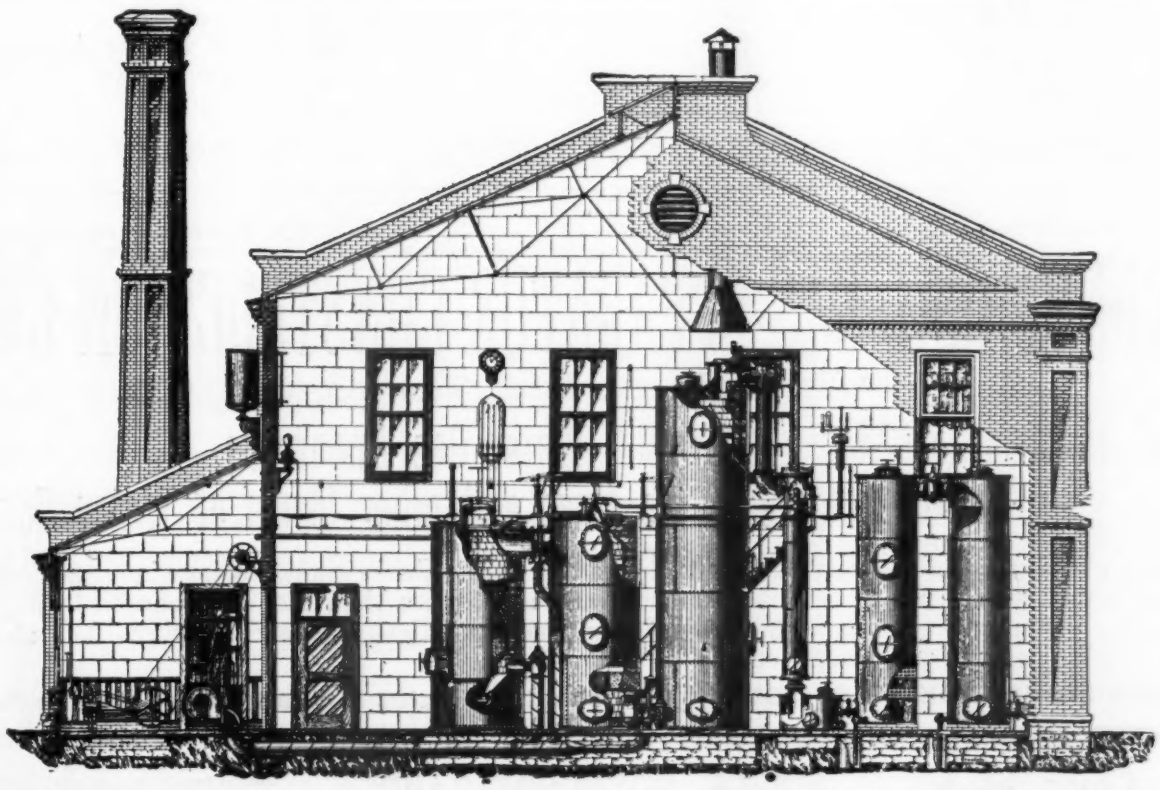

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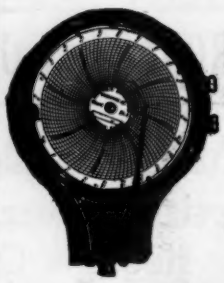

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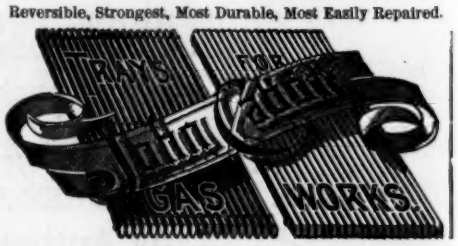

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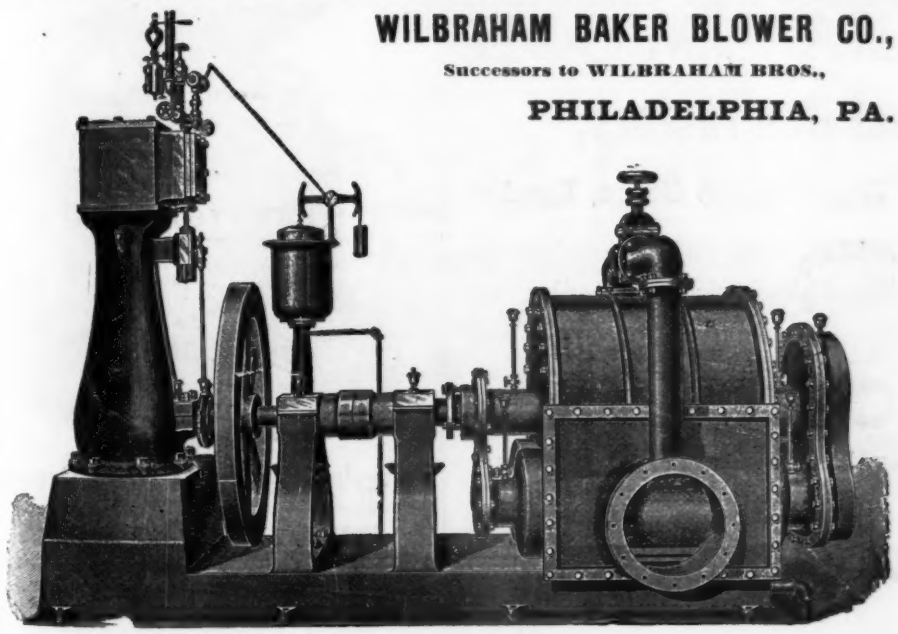

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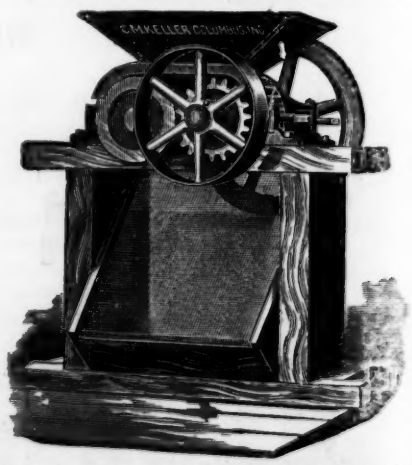

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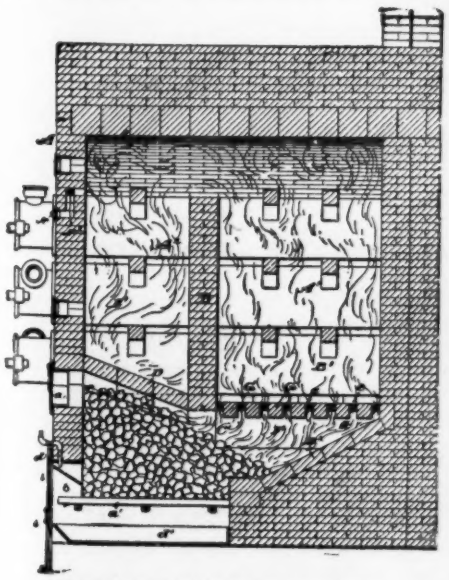

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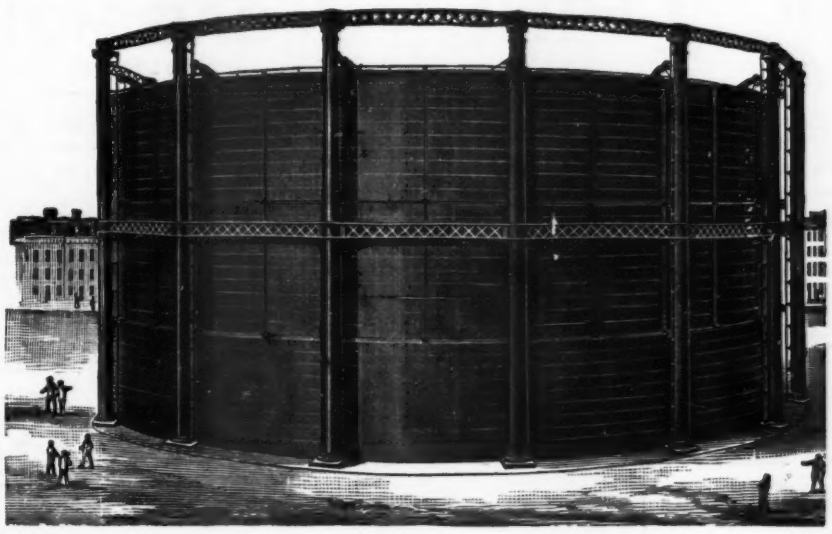

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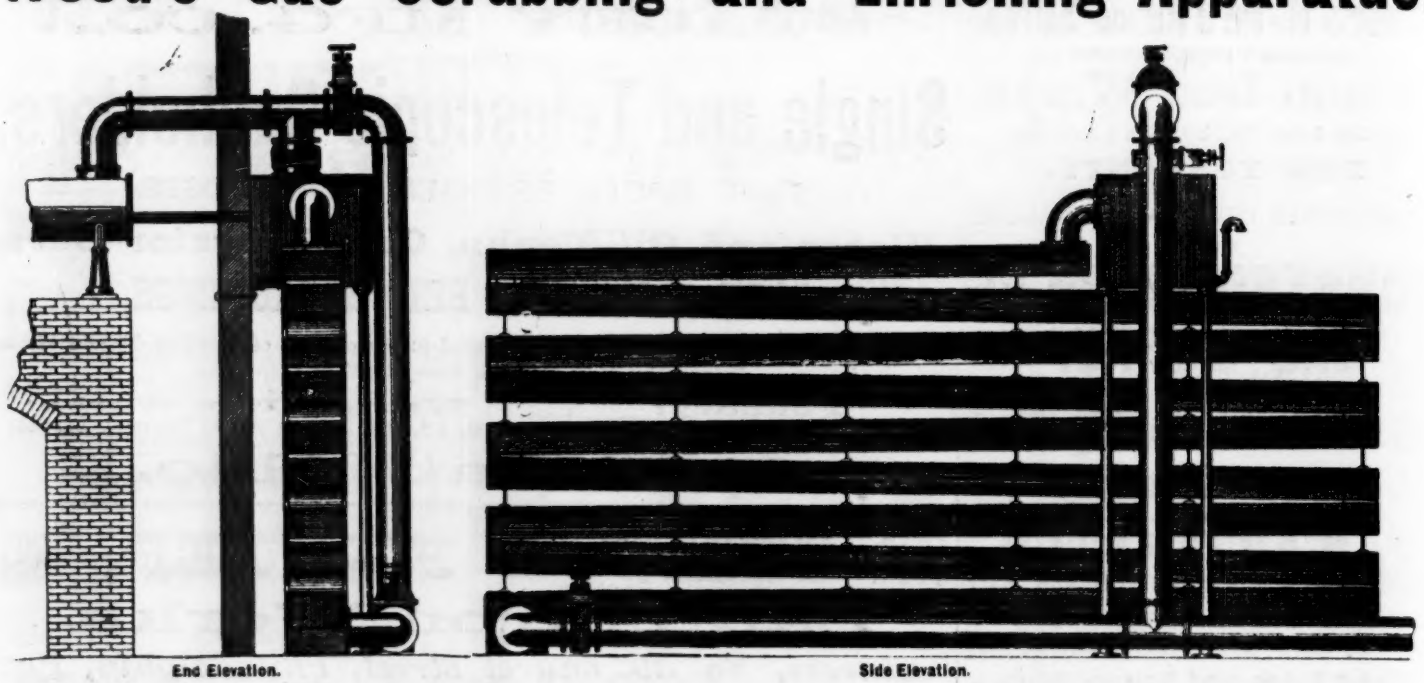

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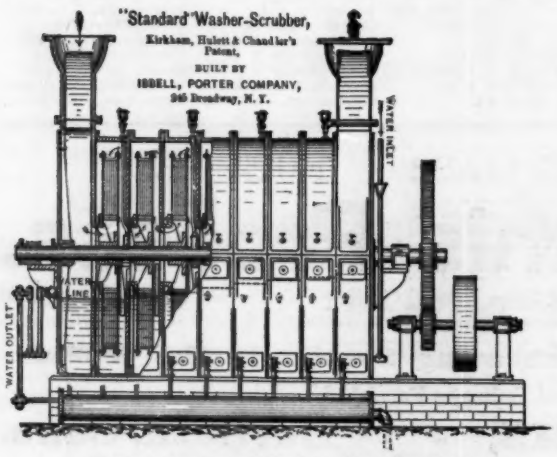

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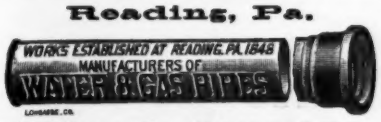

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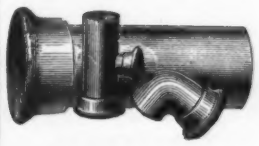

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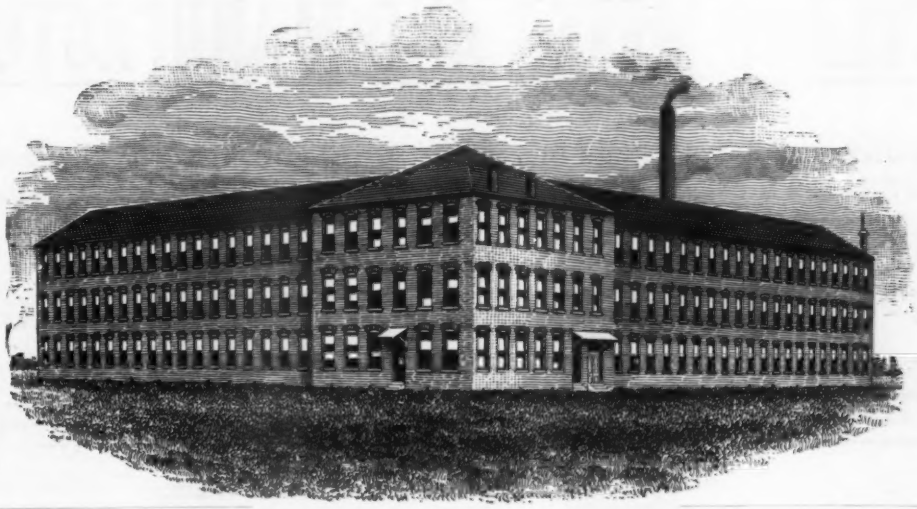

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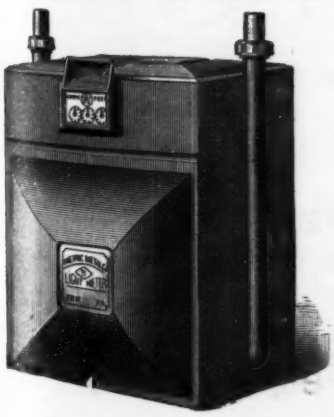

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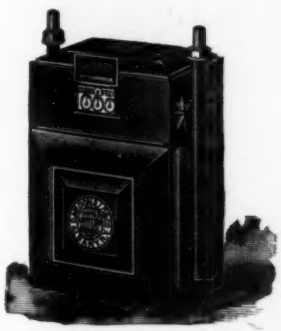

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